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Oakland County, Michigan: Description and Assessment of Stormwater Management Programs in Oakland County

Southeast Michigan Council of Governments
Detroit

Prepared for

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NATIONWIDE URBAN RUNOFF PROGRAM, OAKLAND COUNTY, MICHIGAN

A DESCRIPTION AND ASSESSMENT OF STORMWATER MANAGEMENT PROGRAMS IN OAKLAND COUNTY

December 1980

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Prepared by

Lillian F. Dean
Planning and Management Consultant

for the

Southeast Michigan Council of Governments
8th Floor, Book Building
1249 Washington Boulevard
Detroit, Michigan 48226

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ABSTRACT

TITLE: A Description and Assessment of Stormwater Management Programs in Oakland County

AUTHOR: Lillian F. Dean
Planning and Management Consultant

SUBJECT: The report describes current federal, state, and local government programs which affect stormwater management in Oakland County. The extent to which present stormwater programs benefit stormwater quality is identified.

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ABSTRACT: As background for the implementation of stormwater quality controls in the region, present laws and government programs affecting stormwater are reviewed. The study focuses on federal, state, county, and local government management programs which affect stormwater runoff in Oakland County, Michigan. Programs of the Oakland County Drain Commissioner which affect stormwater are discussed in detail and assessed for water quality impacts. The findings from a survey of local government stormwater management programs (including planning, regulatory, and maintenance programs) are reported.

A DESCRIPTION AND ASSESSMENT OF STORMWATER MANAGEMENT PROGRAMS IN OAKLAND COUNTY

December 1980

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1249 Washington Boulevard
Detroit, Michigan 48226

PREFACE

As stated in the '208' Water Quality Management Plan for Southeast Michigan, stormwater runoff from new developments is a substantial source of nonpoint pollution affecting the region's rivers, streams, and lakes. Studies indicate that pollution from new development is the most feasible to control. It is the policy of the Southeast Michigan Council of Governments that all new development be designed and managed to reduce stormwater pollutant loadings. The '208' Plan assigns the Southeast Michigan Council of Governments the responsibility of developing water quality protection guidelines for use by drain commissioners and local governments.

This report is the first in a series of management analyses which will identify ways to implement technical water quality protection guidelines. The report describes current federal, state, county, and local government programs which affect stormwater management in Oakland County. Present programs are reviewed to determine the extent to which a county-wide management system exists and the extent to which present stormwater programs and policies benefit stormwater quality.

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CHAPTER I

INTRODUCTION TO STORMWATER QUALITY MANAGEMENT

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INTRODUCTION TO STORMWATER QUALITY MANAGEMENT

INTRODUCTION

Stormwater quality management can be approached from two separate but interrelated directions. First, technical measures (often called "best management practices") which improve stormwater quality can be identified. Second, laws and programs which provide a framework for implementing technical measures can be identified and used. Effective stormwater quality management will not occur without strong technical and management components.

The Southeast Michigan Council of Governments (SEMCOG) is presently researching technical methods and measures for stormwater quality control. The purpose of this report is to complement the technical research by assessing the present institutional framework (including agency programs and policies) which can be used to implement technical measures. Technical measures which have major benefits for water quality often can be applied on new development sites. For this reason, the institutional assessment focuses on development control programs in urbanizing communities.

Two basic questions are addressed in the assessment:

1. To what extent does an institutional framework for stormwater management exist throughout Oakland County?

2. To what extent do present government policies and requirements related to stormwater control benefit water quality?

In order to allow for a detailed inventory and assessment, a single county -- Oakland County -- is the focus of the analysis. A short review of policies followed in other Southeast Michigan counties is also included.

This chapter introduces the subject of stormwater quality management and summarizes the major findings from the assessment. Chapters II, III, and IV describe and assess federal, state, county and local programs and policies affecting stormwater management. Stormwater management program summaries for thirty-five local jurisdictions in Oakland County are contained in the appendices.

A major finding of technical analysis completed by the Southeast Michigan Council of Governments through the '208' water quality management planning program has been that on-site retention and detention of stormwater can have major water quality and water quantity control benefits. The Water Quality Management Plan for Southeast Michigan places this finding into policy form by stating:

> **"...all new development shall be designed and managed to reduce stormwater pollutant loadings to receiving waters by best management practices."**
>
> -Plan policy IV.D.1

The use of man-made retention or detention basins and the use of natural areas and wetlands for on-site storage help to meet this policy. Reflecting the '208' Plan direction, this report focuses on the management of stormwater on the development site. The relationship of federal, state, county, and local programs to on-site stormwater management is highlighted.

The terms "retention" and "detention" are used by engineers, planners, and officials in a number of different ways. Many people use the term "retention" to refer to both retention and detention facilities. From a technical standpoint, however, the majority of retention/detention facilities in Oakland County (and Southeast Michigan) are actually detention facilities.

The following definitions of "retention" and "detention" reflect the use of the terms in this report:

Retention: The permanent holding of stormwater in a natural or manmade basin, with or without an outlet to surface waters. Because stormwater is held over a long time period, retention basins are "wet" basins.

Detention: The temporary storage of stormwater in a natural or manmade basin. Detention basins are usually designed to discharge stormwater to a receiving stream or storm drain within a 24-48 hour period at a controlled rate. Percolation basins which hold stormwater until natural infiltration to groundwaters occurs serve a stormwater detention function. Detention basins are dry during most times of the year.

Because of the confusion over these two terms, the term "retention/detention" is frequently used in this report to refer to both types of basins. Most basins in Southeast Michigan are detention basins.

WHY MANAGE STORMWATER QUALITY?

The quality of surface waters and groundwaters affects Southeast Michigan residents in several ways. First, water quality affects public health when water is used for drinking or contact recreation. Water quality also affects the use of natural areas for fishing, boating, and other popular sports. Finally, water quality influences the attractiveness of the region's streams, lakes, and rivers, as well as the property values of adjacent lands. Protection of water quality has both economic and community benefits.

Stormwater runoff from urban and urbanizing areas is a significant contributor of pollutants to the waterways of Southeast Michigan. Urban stormwater carries suspended solids which create murky waters and can smother fish and small organisms. In the River Rouge watershed, for example, urban stormwater contributes 42 percent of all suspended solids in the River Rouge -- a percentage which is equivalent to all industrial dischargers and wastewater treatment facility discharges combined.[1] Significant quantities of other pollutants such as BOD5 (biochemical oxygen demand over a five day period), nitrogen, and phosphorus also are carried to surface and groundwaters by stormwater. Heavy metals, oils, and other materials which may cause cancer are found in stormwater runoff in some locations.

When urbanization occurs, the volume of stormwater runoff as well as the rate of discharge from the land increase (see Figure 1). These increases are caused by impervious surfaces (resulting from pavement and structures) which cover soils and disturb natural vegetation which otherwise would slow and absorb stormwater. If stormwater runoff is not properly managed, both flooding and water quality problems can be easily transferred to downstream communities. A 1976 study completed by Dr. E.F. Brater for the Clinton River Watershed Council, the Oakland County Board of Commissioners, and five local governments in Oakland County concluded that urban development in the upper portion of the Clinton River Basin has raised the flood peaks to about five times their level prior to urbanization.[2] In addition to creating problems for downstream neighbors, communities which fail to properly manage stormwater may be subject to costly court cases, court-imposed development restrictions, and possible liability for flooding and environmental damages.

THE MICHIGAN ENVIRONMENTAL PROTECTION ACT

Federal, state, or county laws do not require government agencies to regulate development specifically for purposes of stormwater quality control. At the same time, however, agencies are not prevented from doing so. In fact, the Michigan Environmental Protection Act (Act 127, P.A. of 1970) imposes a duty upon all government agencies and individuals to prevent or minimize water pollution and other environmental degradation while carrying on normal activities. Environmentally adverse actions should not be taken unless no feasible and prudent alternative exists and the action conforms to the public interest in a sound environment. When administrators don't consider environmental effects, they are subject to law suits by citizens, organizations, and other private agencies. The fact that substantive environmental duties fall upon government administrators was affirmed by the Michigan Supreme Court in the case Ray v. Mason County Drain Commissioner (393 Mich. 294, 224 N.W. 2nd 883 (1975).

The Michigan Environmental Protection Act (commonly called MEPA) is a specific legislative response to Article IV, Section 52 of the 1963 Constitution of Michigan. The constitutional provision reads as follows:

> "The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment, and destruction."

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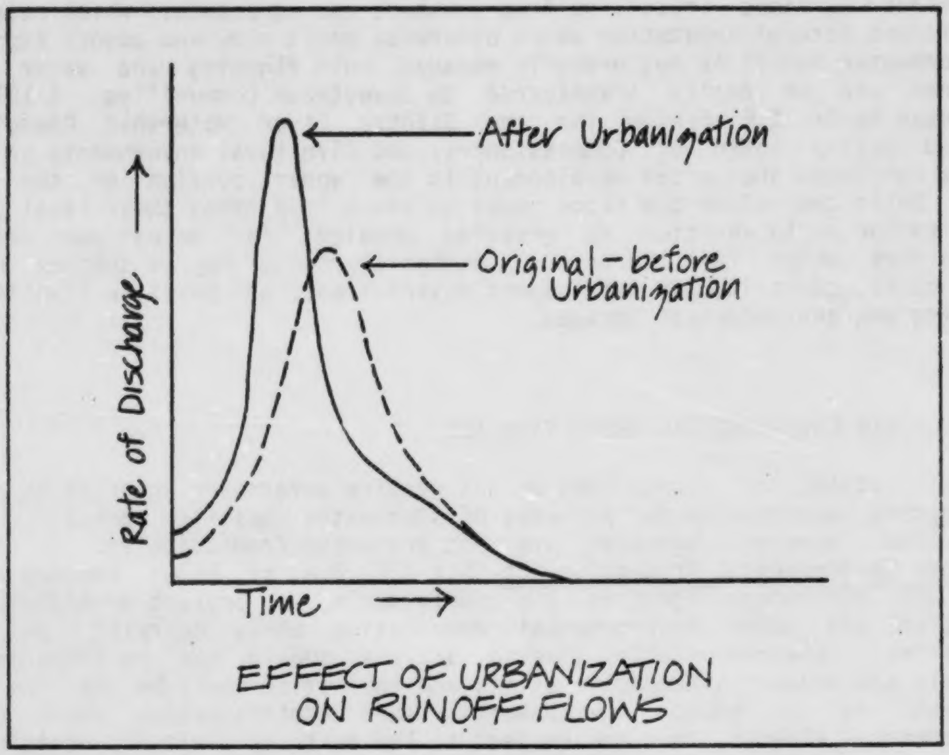
FIGURE 1

EFFECT OF URBANIZATION ON RUNOFF FLOWS



Source: L.B. Leopold, Geological Survey Circular 554, Hydrology for Urban Land Planning, p. 3.

The provisions of the *Michigan Environmental Protection Act* are supplemental to all other laws of the State. The law permits any person or organization (including local governments) to sue any other person or organization in order to protect natural resources from pollution, impairment, or destruction. The Act does not define a point or threshold for polluting activities. Instead, a decision-making process for reviewing any activity which is a potential threat to the environment is established. This law may be extremely important in assuring that communities protect water quality while managing stormwater in the future.

For example, in the court case *Little Wolf Lake Property Owners Association v. Haase*, the township was found to have responsibilities for considering environmental effects from subdivision developments.[3] The township defendant argued that it exercises no statutory duties under the *Michigan Environmental Protection Act* to consider environmental matters when approving plats under the *Subdivision Control Act*. The court disagreed, affirming the application of MEPA to township subdivision reviews.

In the 1972 circuit court case of *Irish v. Green*,[4] the developer of an expensive residential development along the Lake Michigan shoreline near Harbor Springs, Michigan, was required by the court to make substantial changes in original development plans.4 Local and state agencies had approved the proposed subdivision plat under the Michigan *Subdivision Control Act* provisions and generally were made defendants in the court proceedings. The court made a detailed review of the proposed development plan and the site, with numerous expert witnesses describing natural resources which could be affected and possible impacts of the project on the natural resources. Court-imposed restrictions included the following:

- That no more than forty percent of the lots in Plat No. 1 and no lots in as yet unplatted areas of the project should be built upon unless and until central water and sewer are provided;
- That an improved access road be added to divide the traffic burden; and
- That appropriate sodding and other surface water dams, reservoirs, and other devices be provided to restrain the flow of surface water in the subdivision.

The court findings are similar to requirements which might be imposed by a state or local agency completing a development proposal. By thoroughly considering environmental impacts of proposed development (including stormwater quality impacts) it is possible for local governments as well as developers to avoid time-consuming and expensive court cases.

Of special note is the fact that the *Michigan Environmental Protection Act* can be used by local governments to obtain stronger environmental controls from state agencies. In the Southeast Michigan region, for example, Avon Township brought suit against the Michigan Department of Natural Resources for allowing a proposed landfill permit to be issued.

PRINCIPLES OF STORMWATER QUALITY MANAGEMENT

Stormwater management is concerned with the collection, storage, and conveyance of surface water resulting from storm rainfall. The flow of stormwater to subsurface aquifers (groundwaters) as well as surface flows to rivers, streams, and lakes are considered in a comprehensive approach. To properly manage stormwater, it is necessary to consider waters flowing into the local jurisdiction from upstream areas, stormwater flows to downstream communities, and the control of stormwater runoff from sites within the local jurisdiction. In contrast to stormwater management, flood protection is concerned with the alleviation of direct overbank stream flooding.

Stormwater should be managed for two purposes: the control water quantity (to avoid flooding and maintain stream flows) and the control of water quality. Many stormwater control measures and facilities can be designed to serve both purposes effectively. Techniques for stormwater quantity control are well-known; techniques for stormwater quality control are relatively new. As described in this report, the Oakland County Drain Commissioner and many local governments in Oakland County are requiring development practices and stormwater facilities which result in controlled water quantity and quality.

In the past, stormwater management programs have focused on the rapid removal of stormwater runoff from the site. The assumption has often been made that problems will disappear after stormwater leaves the site. Under this conventional approach, storm drains (including enclosed pipes and open ditches) have sometimes been constructed without regard for the control and slow release of stormwater, or possible downstream effects.

Problems created when the conventional approach is used have included the following:[5]

- Large peak flows of stormwater runoff, with related high costs for stormwater conveyance.
- Lowering of groundwater tables and alteration of wetlands.
- Erosion along stream banks due to high velocity flows.
- Transfer of flooding and water quality problems to downstream communities, as well as within the community.

The conventional approach to stormwater management has been characterized by simplistic goals, rigid standards, low engineering review costs, and high construction costs.[6]

In contrast to the "conventional approach", a "modern approach" to stormwater management is being developed across the country. Several county and local agencies in Southeast Michigan have participated in the development of new approaches to stormwater control. The "modern approach" focuses on stormwater as a resource to be used. The natural cycles and processes which occur prior to development are used as a guide for managing stormwater after development has occurred, and natural flow patterns and rates of discharge are retained through special stormwater control facilities and measures. Multiple goals -- including the management of stormwater for quantity and quality purposes -- are followed.

Design standards are followed which allow for innovative engineering approaches and which encourage the consideration of unique site conditions in the site planning process.

Policies emerging from communities practicing "modern" stormwater management include the following:

- Reduce peak flows and improve stormwater quality by retaining stormwater on the site after rainstorms.
- Reduce the volume of stormwater leaving the site by directing stormwater to areas where natural infiltration may occur.
- Release stormwater from retention and detention facilities at a rate which is similar to the pre-development runoff rate.
- Manage stormwater for major floods (100-year frequency storms) as well as minor floods (10-year frequency storms).
- Make stormwater facilities amenities of the development and encourage open space and recreational uses, when possible.
- Protect wetlands and floodplains which serve as natural stormwater storage areas during heavy rainfalls.
- Recognize the inter-relationship of erosion control and stormwater control, and manage stormwater during construction and after construction is completed.

Extensive retention of stormwater in downstream areas may not always be desirable. For example, in some cases, too much retention or detention can contribute to local flooding since upstream stormwater may reach the downstream community at the same time that local stormwater is released. The consideration of upstream and downstream effects and the management of stormwater flows, however, are always possible and desirable.

The implementation of the "modern approach" typically involves somewhat higher costs for development plan review by government agencies, but lower costs for stormwater facility construction.

A number of Oakland County communities are using some or all of these policies in development plan reviews. Government stormwater management programs have changed significantly in the past four-five years, and the evolution is continuing. Although nearly all stormwater management programs in Oakland County have been developed for flood control purposes, it is expected that water quality goals and measures may be added to programs administered by the Oakland County Drain Commissioner and local governments, provided that such measures do not add significant development or maintenance costs.

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OVERVIEW OF COUNTY SUBDIVISION REQUIREMENTS FOR STORMWATER MANAGEMENT IN SOUTHEAST MICHIGAN

The Michigan Subdivision Control Act (Act 288, P.A. of 1967) requires drain commissioners in each county to review subdivision plat proposals to assure adequate drainage. The state law and guidelines developed by the Michigan Department of Treasury do not specify factors which should comprise "adequate drainage" in a subdivision. Each drain commissioner is responsible for adopting rules and regulations for the review of subdivision plats within the drain commissioner's jurisdiction.

In accordance with the Subdivision Control Act and zoning enabling legislation, local governments may review subdivision plats and site plans for adequate drainage as well. Local governments are not required to do so, however. State laws and guidelines do not provide direction to local governments concerning drainage reviews.

To place the Oakland County program survey and assessment (as contained in this report) into a regional perspective, this section briefly highlights stormwater retention and detention requirements of drain commissioners and local governments in each county in Southeast Michigan. Most of the information reported here was obtained through telephone interviews with staff members in each county drain commissioner's office. As refelcted by these summaries, subdivision review policies related to stormwater management and on-site detention/retention are highly varied. Apart from Oakland County communities, there are only a small number of local governments with on-site detention/retention requirements. Variations in topography, development trends, and views of the drain commissioner's role are factors influencing county policies in Southeast Michigan.

Livingston County

The Livingston County Drain Commissioner has adopted "Subdivision Rules and Drainage Policies" which include requirements for stormwater detention/retention basins. In general, all new subdivisions must have stormwater retention or detention facilities. This requirement may be waived if it can be demonstrated to the Commissioner's satisfaction that:

1. The off-site drainage facilities are adequate to receive unrestricted runoff from the development; and

2. It is impractical to provide such facilities.

Dry detention basins which are drained by gravity flow are encouraged. Storage for approximately 1 inch of runoff from the entire site is generally required. Routing of stormwater to lowland and wetland areas on the site is strongly discouraged, although the use of off-site wetlands as stormwater detention areas (especially if the development is adjacent to a stream or river) is sometimes considered a substitute for an onsite basin.

Some provision for maintenance of stormwater retention/detention facilities must be made when the plat is reviewed. If the municipality is unwilling to provide maintenance, the landowner may petition the Drain Commissioner to establish a county drainage district. Commitments from homeowner associations without

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taxing powers to maintain facilities will be accepted only if it can be demonstrated that other alternatives for operation and maintenance of facilities do not exist. The Livingston County Drain Commissioner maintains retention/detention basins throughout the County.

The City of Howell and the City of Brighton are two local governments in Livingston County which require on-site retention/detention for subdivision plats and site plans when receiving waters or receiving drains are inadequate. Townships frequently request assistance from the Drain Commissioner in reviewing large-scale development proposals.

St. Clair County

Although subdivision drainage rules and regulations have been drafted by the St. Clair County Drain Commissioner, the rules have not been adopted. On-site retention and detention of stormwater is viewed as desirable in many cases, provided that adequate facility maintenance is provided. The Drain Commissioner is concerned that maintenance will not be carried out if facilities are constructed.

Few local governments in St. Clair County require on-site detention or retention of stormwater.

Washtenaw County

The Washtenaw County Drain Commissioner adopted rules in 1979 which govern stormwater drainage facilities of new subdivisions. On-site management of stormwater is required for all development proposals, with the maximum allowable outflow from the subdivision restricted to undeveloped runoff conditions. Storage volume equal to or in excess of the runoff from a 100-year frequency storm must be provided. Retention and detention basins, as well as dished parking lots are frequently used by developers to meet these requirements.

Of special note are the requirements which are directed toward water quality management. All drainfields or septic areas must be further than 100 feet from any lake, river, or stream. In addition, special steps must be taken to reduce erosion and sedimentation problems. The development plan must conform to the topography and soil conditions so as to create the least erosion potential. Every effort must be made to reduce the velocity of flow at storm drain outlets.

Although not stated in the rules, the Washtenaw County Drain Commissioner encourages the preservation of lowlands and wetlands for stormwater retention purposes. Although the use of wetlands for stormwater retention does not affect the storage volume required for retention or detention facilities, the Drain Commissioner reviews each plan to insure that maximum use is made of natural areas.

Maintenance of all drainage facilities and structures must be overseen by a responsible governmental agency. If the local government is unable or unwilling to assume maintenance responsibilities, the Drain Commissioner will establish a drainage district and maintain the facilities. The use of homeowner associations is discouraged, unless there is a county assessment district established as a backup to provide financing for maintenance if the homeowner association does not meet its responsibilities.

Two local governments in Washtenaw County -- Pittsfield Township and the City of Ann Arbor -- have adopted stormwater retention and detention requirements. Several other local governments require retention/detention in cases when downstream flooding is anticipated.

Macomb County

The Macomb County Public Works Commissioner has adopted rules pertaining to subdivision plat reviews and drainage requirements. However, the rules are outdated and are currently undergoing revisions.

When subdivision plats are reviewed to insure adequate drainage, the Macomb County Public Works Commissioner considers the need for on-site retention/detention of stormwater. The technical review is directed toward the size of the stormwater outlet (usually a pipe or channel) and downstream effects. The Public Works Commissioner encourages large-scale retention facilities which serve more than one development.

In reviewing development proposals, the Public Works Commissioner tries to reduce facility maintenance needs. The assignment of maintenance responsibilities to a government agency or homeowner association is required.

Although several local governments in Macomb County require the on-site retention of stormwater in order to prevent downstream flooding, such requirements are not widespread.

Wayne County

The Wayne County Drain Commissioner has adopted rules pertaining to subdivision plat reviews and drainage requirements. The rules, however, do not include specific standards related to the amount of stormwater runoff permitted from the site or the rate of discharge.

Although standards are not specified in the rules, the Office of the Drain Commissioner reviews each subdivision plat and the proposed drainage scheme to determine if existing storm drains have sufficient capacity to handle the additional runoff without causing downstream flooding. If downstream flooding is a potential problem, the Drain Commissioner requires that runoff from the site be restricted to the pre-development rate of runoff. This requirement, in turn, leads landowners to provide retention basins or overland flow areas to store stormwater runoff and provide for the gradual release of the stormwaters.

From a technical standpoint, it is difficult to identify the contribution of small subdivision plats to downstream flooding. In addition, an extensive system of enclosed storm drains presently exists in Wayne County which provides for the removal of certain quantities of stormwater without downstream flooding. As a result of these factors, restrictions in stormwater discharge from the site are often not required.

As a result of local government requirements for stormwater retention/detention as well as the growing recognition that retention/detention provides benefits to community residents as well as persons living downstream, a number of developers in Wayne County are proposing the construction of retention and detention facilities. In some cases, basins are proposed and, in other cases, open space areas such as lowland areas are designated as stormwater retention sites. The Wayne County Drain Commissioner recognizes the benefits of on-site stormwater retention/detention and is considering the desirability of formulating guidelines to define, on an objective basis, the extent to which retention or detention should be required.

Maintenance of stormwater retention/detention facilities is the responsibility of the private landowners or the local governments -- the Wayne County Drain Commissioner does not maintain facilities on private property. However, if the Drain Commissioner identifies a potential maintenance problem while completing a technical review of the proposed subdivision plat, the Drain Commissioner may require that special provisions for maintenance be made.

Several local governments in Wayne County have developed their own requirements for the on-site detention of stormwater for new developments. For example, Plymouth Township requires stormwater retention/detention for subdivision plats and site plans equivalent to the 100-year storm frequency.

Monroe County

The Monroe County Drain Commissioner does not have subdivision plat review requirements related to on-site retention of stormwater. Through the County's "Drainage Task Force", however, proposed regulations encompassing on-site retention and detention concerns may be developed in the future.

In the review of subdivision plats for drainage purposes, staff in the Drain Commissioner's office review the size and capacity of the receiving stream. If the capacity is restricted (as is usually the case), on-site detention or retention is required. Parking lot storage is the typical approach followed by developers, although several basins have been constructed. In order to avoid maintenance problems, dry basins are encouraged. If detention basins are deep and pose a safety hazard, fences are required. Storage capacity equivalent to runoff for at least a 10-year storm frequency is required. In some cases, storage capacity for a 25-year storm frequency is required.

The Drain Commissioner also encourages local governments to submit site plans for an advisory stormwater review. The review is encouraged in order to avoid downstream flooding problems.

Several local governments in Monroe County have considered or have adopted stormwater retention and detention requirements. Bedford Township, Monroe Township, the City of Monroe, and Frenchtown are examples of local governments which sometimes require on-site retention. In Bedford Township, stormwater regulations including requirements for restricted stormwater discharges have been included in the Township's Zoning Ordinance.

Oakland County

The Oakland County Drain Commissioner has adopted "Procedures and Design Criteria for Subdivison Drainage in Oakland County." Several of the technical standards in the design criteria do not reflect present practice. The design criteria will be updated in the near future.

The Oakland County Drain Commissioner requires the on-site detention or retention of stormwater if the storm drain outlet is incapable of handling the developed runoff. Except on sites adjacent to the major rivers, lakes or recent drains, on-site retention or detention is required throughout the County. Detention/retention basins must be designed for a 10-year frequency storm. Discharge at the pre-development or agricultural rate (0.2 cfs/acre) is required. Basins without outlets must be large enough to handle runoff from two 100-year frequency storms, back-to-back.

Natural infiltration of stormwater using depressions, lowlands, and wetlands is an acceptable alternative for stormwater retention/detentions. The use of natural lowlands has often been found to make efficient use of land and to be attractive. The major technical restriction is the rate of infiltration; pools of standing water need to be avoided. Shallow swales may be useful for stormwater conveyance but may rapidly silt up and loose their effectiveness.

Additional requirements relate to soil erosion, sedimentation, and pollution control. For example, the development plan should be fitted to the topography and soils so as to create the least erosion potential. Wherever feasible, natural vegetation should be retained and protected. These requirements assist the Oakland County Drain Commissioner in coordinating subdivision plat drainage review requirements with erosion and sedimentation control permit requirements, also issued by the Drain Commissioner.

Developers are required to make arrangements for facility maintenance with subdivision homeowner associations, the municipality, or the Drain Commissioner.

Other requirements of the Oakland County Drain Commissioner are described in Chapter III of this report.

Many local governments in Oakland County require on-site retention or detention of stormwater in new developments. In approximately half of the local governments, engineering design standards pertaining to retention/detention basins have been developed. In the other local governments, policies are uniformly administered but regulations have not been adopted. Some local governments have standards which are more stringent than those administered by the Oakland County Drain Commissioner and several local governments consider water quality and environmental protection to be important reasons for undertaking stormwater management.

SUMMARY OF MAJOR FINDINGS

Programs and policies administered by federal, state, county, and local agencies which affect stormwater management in Oakland County are described and assessed in the chapters which follow. The major findings from the program assessment are summarized below.

Findings are organized into two categories: findings related to the overall institutional system (that is, the laws and programs which provide for stormwater management) and findings related to policies followed by Oakland County communities.

An Institutional System for Stormwater Management

1. With the exception of the Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972), Michigan state laws do not require stormwater management for water quality purposes. The soil erosion and sedimentation control requirements, however, primarily apply to the construction phase of development. Permanent stormwater detention or retention facilities or other stormwater control measures to enhance water quality are not required, although Act 347 allows for their review when included in development proposals.

2. Although a single state law does not provide for stormwater management for water quality purposes in a comprehensive way, the Subdivision Control Act (Act 288, P.A. of 1967) does establish an institutional system for stormwater management. As required by the Act, the Oakland County Drain Commissioner reviews subdivision plats to insure that adequate drainage is provided. Technical approaches for stormwater management, however, are not specified in the law or related guidelines of the Department of Treasury. The Oakland County Drain Commissioner has elected to administer rules which encourage on-site retention/detention of stormwater and other policies which benefit water quality. The purpose of the Oakland County program, however, is water quantity control -- not water quality. Site plans for developments which are not subdivision plats are not always subject to review and approval by the Drain Commissioner.

3. The Oakland County Drain Commissioner issues permits for connections or crossings of county drains. Unless the drain has been recently constructed, discharge is limited to agricultural rates. Similarly, the Oakland County Road Commission limits drainage into roadside drains to agricultural rates in many cases.

4. The Subdivision Control Act and zoning enabling legislation for cities, villages, and townships are sufficiently broad to allow local governments to review development proposals for stormwater management purposes. When local governments review developments for stormwater management purposes, they typically apply technical requirements to all types of developments, including small and large site plans and subdivision plats. Specific technical standards to be used by local governments are not specified in State laws.

   Thirty of the thirty-five Oakland County townships and cities surveyed indicated that they apply stormwater retention and detention requirements to many development proposals. Local governments, therefore, strongly feel that stormwater management is a local responsibility as well as a county responsibility.

5. Although several state and federal laws affect stormwater management practices in Oakland County, these laws typically focus on resource protection -- not the management of runoff before or after it leaves development sites.

6. Therefore, as a result of the Drain Commissioner's subdivision plat reviews (required by the Subdivision Control Act) and stormwater management programs which local governments have elected to develop, an

institutional system for stormwater management on a county-wide basis exists in Oakland County. The present institutional system provides for the management of stormwater from new developments, and applies to both site plans and subdivision plats in most local jurisdictions.

7. Although a county-wide institutional system for stormwater management has developed in Oakland County there is no mechanism for implementing technical standards and policies throughout the County, apart from the Oakland County Drain Commissioner. The Oakland County Drain Commissioner's policies, of course, apply to subdivision plats throughout the County. Although the Oakland County Drain Commissioner influences local government standards and policies, the Drain Commissioner does not review and approve those policies.

   The influence and importance of the Drain Commissioner as a central source of technical information and advice, however, should not be discounted. In Oakland County, it is believed that the retention/detention policies of the Drain Commissioner have had a strong effect on the stormwater requirements of local governments.

8. Although many local governments in Oakland County require on-site detention and retention of stormwater (and other stormwater management requirements), nearly half of the local governments surveyed have not adopted ordinances or engineering design standards related to stormwater management. The lack of adopted stormwater standards weakens local government enforcement capability and raises questions about the permanency of the requirements.

9. Few local jurisdictions have stormwater management planning programs. This gap is a significant weakness in the present institutional system for stormwater management in Oakland County. Planning programs could serve the purpose of identifying solutions to recurring stormwater problems, and could provide information to guide technical stormwater reviews.

10. Many local governments in Oakland County (as well as the Oakland County Drain Commissioner) are concerned about adequate maintenance of stormwater facilities such as retention and detention basins. Many local governments depend upon property owners' associations to provide maintenance for subdivision plats. Basin maintenance for other sites, however, is typically the responsibility of the individual property owner. The lack of community-wide provisions for retention/detention basin maintenance is believed to be a significant gap in the present stormwater management system.

11. Many storm drains in Oakland County are not maintained by any government agency. Although local governments sometimes undertake emergency cleaning operations, most local governments do not have storm drain maintenance programs. The lack of responsibility for maintenance is a gap in the legal and institutional structure.

Stormwater Policies and Technical Measures with Water Quality Benefits

1. With the exception of erosion control permits, present stormwater management requirements developed by the Oakland County Drain Commissioner as well as requirements of most local governments are directed toward stormwater quantity control -- not stormwater quality. Many stormwater control methods used in Oakland County, however, have significant stormwater quality as well as quantity benefits.

2. Three policies which have significant stormwater quality benefits and which are widely practiced by Oakland County communities include:

   - Retention or detention of stormwater on the site, with discharge to a receiving body at a pre-development or agricultural rate (0.2 cfs/acre). Seventeen townships and ten cities require storage volume for a 10-year frequency storm at a minimum. Ten local governments require at least a 100-year frequency storm volume retention for basins with no outlet, and four local governments require the equivalent of a 100-year frequency storm volume (or more) for all basins.

   - Natural infiltration of stormwater on the site encouraged by the use of swales, depressions, and natural areas for detention. Fifteen townships and three cities actively encourage natural infiltration of stormwater on the site. The technical approach used to encourage natural infiltration varies with individual sites, reflecting varying natural conditions. The fact that many Oakland County areas have soils which are conducive to natural infiltration has helped support this approach.

   - Open spaces maximized, including wetlands and floodplain protection. Although most open space preservation efforts and policies are not directed toward stormwater management, they have important stormwater quality and quantity control benefits. Many townships have a cluster development option (or planned unit development option) in their zoning or subdivision ordinances, although cluster development is most prevalent in the rapidly urbanizing areas. Approximately half of the local governments surveyed have wetlands protection policies, although only five have adopted wetlands protection ordinances.

In addition to these policies, many local governments in Oakland County review grading plans submitted with development plans for erosion control as well as runoff control purposes.

3. The Oakland County Drain Commissioner addresses engineering aspects of stormwater control and management when completing subdivision plat reviews. Policies related to open space and wetlands preservation are administered by local agencies with no involvement from the Drain Commissioner.

4. Few local governments in developing areas of Oakland County are anticipating the need to install stormwater retention/detention facilities or drains to manage stormwater outside of new developments. Local

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officials hope that the on-site retention/detention policies administered when site plans and subdivision plats are reviewed will avoid flooding problems downstream as well as on the site.

5. Although many stormwater management requirements administered by local governments have stormwater quality benefits, these benefits are not commonly recognized. Only a small number of local governments consciously view stormwater management as being directly related to environmental resource management.

The implications of these findings for the implementation of stormwater quality measures are clear. In Oakland County, there are established regulatory programs which provide a basis for stormwater quality management. It is expected that technical information and assistance will lead to the incorporation of certain stormwater quality methods into local programs. The incentives which have led to the development of retention/detention requirements -- namely, financial savings (when compared with storm sewers) and concerns about court cases and downstream flooding, will support stormwater quality measures as well. To be implemented, however, stormwater quality measures must be relatively low cost and low in maintenance.

Other counties in Southeast Michigan, however, do not have in place the institutional system for stormwater management which exists in Oakland County. Stormwater management requirements which have direct water quality benefits are less frequently followed, and only a small number of local governments have adopted stormwater regulations related to the on-site retention and detention of stormwater. It is possible, however, that the concerns which have led to stormwater detention/retention regulations in Oakland County will be persuasive in other counties as well. Moreover, drain commissioners potentially can provide leadership for local governments in the area of stormwater quality control.

FOOTNOTES: CHAPTER I

[1] Data developed by the Southeast Michigan Council of Governments in the '208' Water Quality Management Planning Program, reported in Water Quality Guidelines for Development Plan Reviews: A Handbook for Local Officials in Southeast Michigan, October, 1980, p. 52.

Additional data on stormwater pollutants has been obtained by the Washtenaw County Drain Commissioner for a 31 square mile site in Washtenaw County. Runoff during a 24 hour period after a spring snowmelt was found to contribute a suspended pollutant load to the Huron River equivalent to the treated discharges from the Ann Arbor wastewater treatment plant for 68 days. Urban runoff from the same site during a three day period (1-1/2 inches of rainfall) was found to be equivalent to Ann Arbor treatment plant treated discharges for 127 days. These statistics reflect the magnitude of the urban stormwater pollution problem.

[2] Brater, E.F., *A Study of Flood Conditions Along the Clinton River in the Region which Includes the Western Part of Pontiac, Waterford Township, and West Bloomfield Township*, March, 1976, sponsored by the Clinton River Watershed Council, Keego Harbor, the Oakland County Board of Commissioners, Pontiac, Sylvan Lake, Waterford Township, and West Bloomfield Township.

[3] *Little Wolf Lake Property Owners' Association v. Haase*, (No. 74-837-CE, *Decision of July 25, 1975* as reported in Jeffrey K. Haynes, *Michigan Environmental Protecton Act in its Sixth Year: Substantive Environmental Law from Citizen Suits, Journal of Urban Law*, Volume 53, May, 1976, p. 615.

[4] *Irish V. Green*, Emmet County Circuit Court, No. 162-3, July 15, 1972.

[5] Theil, Paul E., Consulting Engineer, in lecture presented to the "Storm Water Management Seminar," Dearborn, Michigan, October 30, 1980, sponsored by the National Corrugated Steel Pipe Association and the American Iron and Steel Institute.

[6] *Ibid.*

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CHAPTER II

FEDERAL AND STATE PROGRAMS AFFECTING STORMWATER MANAGEMENT

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FEDERAL AND STATE PROGRAMS AFFECTING STORMWATER MANAGEMENT

INTRODUCTION

A number of state and federal programs and regulations affect stormwater management in Oakland County and other Southeast Michigan counties. None of the programs, however, offer a comprehensive single program for planning, regulation, construction and maintenance of stormwater facilities. Often individual state and federal laws are directed toward the protection of a particular resource such as wetlands or floodplains.

Federal programs and state programs affecting stormwater management are summarized below. An assessment of state and federal programs in relationship to stormwater management in Oakland County completes the chapter.

FEDERAL PROGRAMS AFFECTING STORMWATER MANAGEMENT

The three federal programs most directly related to stormwater management activities carried out by individual local governments are as follows:

- '208' Water Quality Management Planning conducted in accordance with the federal Clean Water Act;
- Section 404 permits issued by the U.S. Army Corps of Engineers; and the
- National Flood Insurance Program administered by the U.S. Department of Housing and Urban Development.

In addition to these programs, the U.S. Army Corps of Engineers and the U.S. Soil Conservation Service provide technical information which assists local government stormwater management efforts. Soil surveys and flood plain delineation are particularly important in Southeast Michigan. The U.S. Fish and Wildlife Service is completing a state-wide mapping of wetlands resources which will also assist stormwater management efforts.

Several federal agencies, including the U.S. Army Corps of Engineers and the U.S. Soil Conservation Service, carry out public works programs which may be directed toward stormwater drainage and flood control. For example, the U.S. Army Corps of Engineers is authorized by Congress to investigate structural means for controlling flooding in the Red Run/Lower Clinton River area of Oakland and Macomb Counties. Often the large-scale public works programs are remedial in nature, and do not address the need for effective local government programs or watershed-wide planning directed toward multiple objectives.

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Finally, it should be noted that funding for local and state agency stormwater management planning is provided on a very limited basis by several federal agencies. For example, the federal Water Resources Council may fund the Clinton River Watershed Council, a voluntary association of local governments, to conduct a stormwater planning program. Special funding for local government regulatory or maintenance programs, however, is not available.

"208" Water Quality Management Planning

The federal Clean Water Act clearly states the national goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters. The contribution of point sources (industrial and municipal treatment facilities which discharge into waterways) and nonpoint sources (including stormwater runoff and other diffuse sources of pollution) to water quality problems is recognized in the federal laws.

The Clean Water Act sets forth the National Pollutant Discharge Elimination System (NPDES) permit program for regulating point source dischargers. The Michigan Department of Natural Resources administers the permit program within Michigan. NPDES permit requirements are coordinated with state discharge permit requirements. A specific regulatory mechanism for nonpoint sources is not defined in the federal law. Instead, areawide water quality management plans which address all sources of pollutants and identify processes for reducing pollution problems were mandated. Because the requirements for areawide planning are included in Section 208 of the law, areawide plans are often called "208" plans.

The Southeast Michigan Council of Governments (SEMCOG) adopted the Water Quality Management Plan for Southeast Michigan in 1978. Federal grants related to water quality, including municipal wastewater treatment facilities, must conform with provisions of the Plan. The "208" Plan identifies the relationship of stormwater management to water quality in the region and assigns management responsibilities to county and local agencies. Detailed stormwater management guidelines which will be advisory to county and local agencies are presently being developed by the Southeast Michigan Council of Governments as a supplement to the initial "208" Plan.

Section 404 Permits

Section 404 permits are required for the discharge of dredged or fill material in all waters of the United States, including adjacent wetlands. Lakes with public access points as well as rivers are regulated through Section 404. Section 404 permits are issued by the U.S. Army Corps of Engineers in accordance with Section 404 of the federal Clean Water Act. The U.S. Environmental Protection Agency and the U.S. Fish and Wildlife Service review and comment on proposed Section 404 permits before they are issued.

Wetlands regulated through Section 404 permits include bogs, swamps, marshes, and other areas which are inundated or saturated by surface or groundwater. General development activities are subject to 404 permit requirements, while farming, forestry, maintenance on drainage ditches, construction of temporary sedimentation basins, and the construction of certain roads are excluded. No permit will be issued if wetlands serving as important fish and wildlife habitats, water storage areas, water recharge areas, water purification areas, or other public purposes are involved. The U.S. Army Corps of Engineers weighs benefits of the proposed alteration with adverse effects to the public interest in making permit decisions.

Although not directed specifically to stormwater management concerns, the protection of wetlands through the Section 404 permit program results in stormwater management benefits. Stormwater quality is enhanced and stormwater flows off the site are reduced when wetlands are protected. It is possible that in the future, Section 404 permit authority will be suspended in lieu of state requirements administered by the Michigan Department of Natural Resources. Section 404 permits are closely related to wetland protection provided through the Michigan Wetlands Protection Act (Act 203, P.A. of 1979) and the Inland Lakes and Streams Act (Act 346, P. A. of 1972).

National Flood Insurance Program

The National Flood Insurance Program, administered by the U.S. Department of Housing and Urban Development, makes federally-subsidized flood insurance for individual homes and businesses available in communities which meet certain requirements. The adoption of floodplain development regulations is one important requirement.

Floodplain development regulations typically relate to the location and construction of structures in the floodplain. The intent of many local government regulations developed to meet National Flood Insurance Program requirements is to protect structures from flood damage. Local governments are not required to address the environmental values of floodplains. In some cases, however, floodplain regulations substantially reduce development in floodplains, thereby protecting natural floodplain resources.

When floodplains are left in their natural state they can receive and hold some stormwater runoff during rainstorms. Stormwater detention or retention, however, is not a specific purpose of the National Flood Insurance Program.

STATE PROGRAMS AFFECTING STORMWATER MANAGEMENT

Seven state laws which are administered by the Michigan Department of Natural Resources affect drainage and stormwater runoff. In each case, the Department of Natural Resources issues a permit if a proposed development subject to the particular law meets state requirements. The pertinent laws are as follows:

- Goemaere-Anderson Wetlands Protection Act (Act 203, P.A. of 1979)
- Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972)
- Inland Lakes and Streams Act (Act 346, P.A. of 1972)

- Dam Construction Approval Act (Act 184, P.A. of 1963)
- Floodplain Regulatory Authority Under Act 245, P.A. of 1929 (as amended by Act 167, P.A. of 1968)
- Subdivision Control Act (Act 288, P.A. of 1967)
- Water Resources Commission Act (Act 245, P.A. of 1929, as amended) (State Discharge Permit Requirements for Stormwater)

The Wetlands Protection Act, the Soil Erosion and Sedimentation Control Act, the Inland Lake and Streams Act, and the Water Resources Commission Act are directly related to water quality protection. The other laws, however, do affect the discharge of stormwater into rivers, streams, and lakes, and can result in water quality benefits.

In addition to these regulations, the Michigan Department of Public Health regulates stormwater management and drainage facilities in mobile home parks. The Michigan Department of Public Health does not require on-site retention or consider water quality aspects of proposed drainage facilities.

Each of these regulatory programs and its relationship to stormwater quality management is briefly described below.

Goemaere-Anderson Wetlands Protection Act (Act 203, P.A. of 1979)

The Goemaere-Anderson Wetlands Protection Act, passed by the Michigan Legislature in 1979, requires landowners to obtain a state permit before altering certain wetlands. Wetlands contiguous to lakes, ponds, streams, or rivers; non-contiguous wetlands greater than five acres in size; plus sites specially designated by the Michigan Department of Natural Resources are subject to the permit requirements. The term "wetland" is defined in the law to mean "land characterized by the presence of water at a frequency and duration sufficient to support and that under normal circumstances does support wetland vegetation or aquatic life and is commonly referred to as a bog, swamp, or marsh."

In passing the law, the Legislature made the finding that wetland conservation is a matter of state concern. Loss of a wetland may deprive the people of the state of some or all of the following benefits:

- Flood and storm control by the hydrologic absorption and storage capacity of the wetland;
- Protection of subsurface water resources and provision of valuable watersheds and recharging ground water supplies;
- Pollution treatment; and
- Erosion control by serving as a sedimentation area and filtering basin, absorbing silt and organic matter.

These reasons for wetlands protection relate directly to natural stormwater retention and water quality. Additional benefits relate to wildlife habitat, natural food cycles, and agricultural benefits.

Development proposals which involve wetlands subject to the Act may not be undertaken without a wetlands permit from the Michigan Department of Natural Resources. Since stormwater flows typically carry some silt or sediment, a proposed project that involves the discharge of stormwater into wetlands (either through a storm drain pipe or open swale or ditch) will usually require a wetlands permit. Construction of a small sediment trap at the pipe outlet is one technique that may be required for avoiding adverse impacts of stormwater discharge on natural wetlands.

In determining whether a proposed activity in a wetland will be allowed, the Department of Natural Resources will consider the following:

1. The relative extent of the public and private need for the proposed activity.

2. The availability of feasible and prudent alternative locations and methods to accomplish the expected benefits from the activity.

3. The probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated activities in the watershed.

4. The probable impact on recognized historic, cultural, scenic, ecological, or recreational values and on the public health or fish or wildlife.

Other factors include the size of the wetland, wetlands remaining in the general area, proximity to any waterway, and economic value of the proposed land change. Permit decisions must reflect the national and state econcerns for the protection of natural resources from pollution, impairment, and destruction.

The Goemaere-Anderson Wetlands Protection Act specifically authorizes local governments to adopt wetlands protection ordinances which are more stringent than the state law. Local governments which adopt ordinances are required to notify the Michigan Department of Natural Resources. The Department of Natural Resources and the local government enter into an agreement which provides for an exchange of information on permit applications. The Department of Natural Resources shall not issue a permit if the municipality has denied the permit application under its own wetlands ordinance unless the proposal involves an overriding regional or statewide public benefit.

Several local governments in Oakland County (five townships and two cities) presently administer their own wetlands protection ordinances. It is expected that many of these ordinances will be submitted to the .Department of Natural Resources for approval under the state law. Local government wetland protection ordinances may regulate all wetlands areas, including areas isolated from waterways and less than five acres in size which are excluded from the state wetlands permit program.

Wetlands are sometimes called nature's "sponge", since some wetlands retain stormwater runoff and reduce downstream flooding. As a result of this natural detention capability, the presence of wetlands near urban developments often

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reduces the total volume of stormwater flowing off the site. In addition, some wetlands filter silt and other pollutants from stormwater and convert inorganic nutrients into acceptable nutrient material. The preservation of natural wetlands on a development site, therefore, directly benefits stormwater quality. Provided that direct discharge of stormwater into wetlands through pipes and ditches is not involved, it is not expected that the preservation and use of wetlands on development sites for natural stormwater retention (through overland flow) will require a state permit.

Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972)

The Michigan Department of Natural Resources provides technical assistance and training programs for county and local agencies administering permits in conformance with the requirements of the Soil Erosion and Sedimentation Control Act. The intent of the Act is to effectively reduce accelerated soil erosion and resulting sedimentation, thereby protecting water quality.

Cities, villages, and charter townships may administer the permit program within their jurisdictions if they choose to do so. Counties issue permits for general law townships and for jurisdictions which do not wish to issue their own permits. If the development proposal is within the jurisdiction of two or more enforcing agencies, the erosion permit is obtained from the Michigan Department of Natural Resources. The Department of Natural Resources reviews and approves local erosion and sedimentation control ordinances and completes periodic performance reviews of local agencies.

Enforcement agencies (local, county, or state) issue permits for certain activities which disturb one or more acres of land or which are located within 500 feet of a lake or stream. In order to obtain a soil erosion permit, the developer or landowner must submit an erosion and sedimentation control plan which describes the following: soil conditions, present and proposed on-site drainage facilities, the timing of the proposed earth change, proposed temporary and permanent erosion control measures, and a program for continued maintenance of all permanent soil erosion control facilities (among other requirements). A detailed technical review is completed by the permit agency, and, if adequate control measures are provided, a permit is issued.

In Southeast Michigan, the soil erosion and sedimentation control programs carried out by county and local agencies in cooperation with the Department of Natural Resources provide the principle method for controlling stormwater runoff and erosion during construction activities.

Inland Lakes and Streams Act (Act 346, P.A. of 1972)

In conformance with the Inland Lakes and Streams Act (Act 346, P.A. of 1972, as amended) and rules of the Michigan Department of Natural Resources, a permit is required to create, enlarge, or diminish an inland lake or stream or to build a structure in a lake or waterway. Natural or man-made lakes, ponds, and impoundments (including retention basins), county drains, and other bodies of water which have definite banks, a bed, and visible evidence of a continued flow of water may be subject to the provisions of the Act. A lake, pond, or impoundment must meet at least one of the following conditions in order to be subject to permit requirements:

- Have a surface area of more than five acres;
- Be connected to an existing inland lake or stream; or
- Be located within five hundred feet of an existing inland lake or stream.

The maintenance and improvement of county drains established prior to 1973 are exempted from the provisions of the law, provided that they are not specifically identified in the rules of the Department of Natural Resources.

Rules for bridge construction are included in the inland lakes and streams program. Each bridge construction project must be completed so as to minimize erosion and siltation of streams or lakes.

Inland lakes and streams permits will not be issued if the proposed project will adversely affect the public trust or riparian rights. A second important requirement in the law is that permits will not be granted for projects which will unlawfully impair or destroy waters or other natural resources. Possible effects of the project upon the inland lake or stream, upon waters from which or into which its waters flow, and the uses of all such waters must be considered.

Criteria which are used by the Department of Natural Resources in reviewing permit applications are contained in the rule pertaining to environmental assessments (Rule 281.814). All permit applications must identify all existing and potential adverse environmental effects and a permit will not be issued unless the following is determined:

1. That the adverse effects to the environment and the public trust are minimal and will be mitigated to the extent possible;
2. That the resource affected is not a rare resource;
3. That the public interest in the proposed development is greater than the public interest in the unavoidable degradation of the resource; and
4. That no feasible and prudent alternative location is available.

Many retention/detention basins which are designed to hold water over long periods of time require an inland lakes and streams permit. In reviewing retention/detention basin proposals, the Michigan Department of Natural Resources directs attention to the outlet structure and potential environmental effects. When water quality problems will result from stormwater discharges from basins, modifications to the basins may be required. Downstream impacts on fish and wildlife resources are of particular importance. An engineering review of the storage capacity of the structure, however, is not completed.

As referenced above, the Inland Lakes and Streams Act does affect stormwater management practices in Southeast Michigan and is directly related to water quality protection. The Act does not, however, provide for a comprehensive review and approval of retention and detention basins. In addition, there is no mechanism for requiring that a basin be constructed in a particular location.

Dam Construction Approval Act (Act 184, P.A. of 1963)

The Dam Construction Approval Act requires the issuance of a permit for the construction of dams which impound more than five acres of land or which have a hydrostatic head of five feet or more of water during the design storm. Many retention and detention basins are subject to requirements of this law, although permit requirements are not widely known. The law is administered by the Michigan Department of Natural Resources.

The primary purpose of the state regulation is to assure that safe dams are constructed. All dams are inspected by the Department of Natural Resources prior to approval. After issuance of a permit, the Department of Natural Resources will inspect completed dams on a request basis. Although the law includes provisions for the protection of fish, wildlife, and recreational values, state officials do not duplicate the technical reviews completed for Inland Lakes and Streams Act permits (Act 346, P.A. of 1972). The functioning of basins for water quantity or water quality purposes is not reviewed through the dam construction approval program.

The Dam Construction Approval Act states that all lakes and dams constructed in accordance with the provisions of the Act must have an established lake level. The Act references the Inland Lake Level Act (Act 146, P.A. of 1961) which provides for court-established lake levels following petition by the county board of supervisors. The Inland Lake Level Act provides for maintenance of lake levels by the county drain commissioner or road commissioner, financed through special assessments to benefiting property owners. The Michigan Department of Natural Resources has made an administrative determination that retention and detention basins are generally not subject to these lake level requirements, even though a dam construction permit may be needed.

Floodplain Regulatory Authority Under Act 245, P.A. of 1929 (as amended by Act 167, P.A. of 1968)

The Water Resources Commission Act (Act 245, P.A. of 1929) is Michigan's primary pollution control law, providing the Water Resources Commission with the authority to enforce laws related to the pollution of the waters and the obstruction of floodways. Section 323.5b of the Water Resources Commission Act prohibits occupation, filling or grading of lands in the floodplain, stream bed, or stream channel unless a permit has been obtained. Agricultural activities are exempt from the permit requirements.

Amendments to the Act made in 1968 clarify the jurisdiction of the Water Resources Commission to regulate floodplain activities. Channels and the floodway portion of the floodplain must be kept free and clear of all interference or obstruction which will cause any undue restriction of the capacity of the floodway. Uses of the floodplain must not harmfully interfere with the discharge or stage characteristics of a stream unless a permit has been issued. Commission rules, however, exempt activities in areas where the upstream drainage is under two square miles.

Rules adopted by the Department of Natural Resources more specifically define the scope of permit requirements. Encroachments in the floodway (directly adjacent to the stream channel) must not be approved if they will interfere with flood stage or discharge characteristics. However, encroachments in the remainder of the floodplain that do not cause harmful interference to the waterway may be approved. Bridges or culverts must not harmfully interfere with the 100-year frequency flood.

Although a first reading of the Water Resources Commission Act and related floodplain management rules leads to a conclusion that the law helps to keep floodplains in a natural state, this is not the case. In administration of the permit requirements, attention is given to backwater effects but not to effects of a structure on stormwater storage or runoff rates. The Department of Natural Resources does not usually have definitive data to show the effect of development on storage and runoff. One of the few exceptions at the present time is the Clinton River Forks area where sufficient data is available to show how the loss of floodplain storage may affect a stream's flows. In this area, the Department of Natural Resources requires compensation of the loss of storage capacity by excavation or other measures to increase storage.

In conclusion, the Water Resources Commission Act provides some benefits for stormwater quality, since it protects floodways from development. Benefits to stormwater quality in other areas of the floodplain, however, vary. This law is not directed toward management or protection of the natural floodplain.

Subdivision Control Act (Act 288, P.A. of 1967)

The Subdivision Control Act establishes procedures for the review and approval of subdivision plats by local governments and county and state agencies. Divisions of land involving five or more parcels each of which is less than ten acres are subject to provisions of the law.

In accordance with provisions of this law, county drain commmissioners review subdivision plats to insure that adequate stormwater facilities are provided. Many local governments adopt subdivision ordinances in accordance with the Subdivision Control Act and review subdivision plats for stormwater management and drainage purposes. The Michigan Department of Natural Resources and the Michigan Department of Public Health are two of several state agencies required to review subdivision plats.

The Natural Resources Commission (through the Michigan Department of Natural Resources) is required to review preliminary subdivision plats if any of the subdivision lies within the floodplain of a river, stream, creek or lake. Residential buildings may not be located on any portion of a lot lying within a floodplain unless rules of the Water Resources Commission are followed.

Alterations of the natural floodplain are permitted if the original discharge capacity of the floodplain is protected and riparian owners are not affected by changes in the stream flow. In many cases, this leads developers to make development plan proposals which do not alter the floodplain. Restrictive deed covenants providing for the protection of the natural floodplain are required.

The rules of the Water Resources Commission related to floodplain alteration and subdivision plats help preserve the capacity of the floodplain to hold stormwater. The rules of the Natural Resources Commission related to floodplains preserve the capacity of the floodway (directly adjacent to the river or stream) and help to preserve the capacity of the flood fringe for stormwater storage. Water quality protection, however, is not an objective of the program.

Discharge Permit Requirements for Stormwater

In general, stormwater runoff is not subject to State of Michigan discharge permit requirements. In particular cases where stormwater creates identified water quality problems and can be connected to a particular activity and landowner, however, a permit may be required.

Examples of activities which have required state discharge permits (and related NPDES discharge permits) in the past include the following:

- Pipes which carry stormwater with known pollutants, such as storm pipes in junkyards with oils and other hazardous materials, or pipes from certain industrial loading docks or open material storage areas where a potential exists for pollution being present in the stormwater runoff.
- Runoff from concentrated animal feeding operations, depending on the size.
- Stormwater runoff from industrial site parking lots when concern related to potential water quality problems exists (such as the proposed General Motors plant in Orion Township).

Permits are likely to be needed in cases where a potential for water quality problems can be demonstrated. Stormwater discharges into inland lakes are a particular concern for water quality protection. Discharge permits are issued in accordance with provisions of the Water Resources Commission Act (Act 245, P.A. of 1929, as amended) and the federal Clean Water Act.

Regulation of Mobile Home Parks

The Mobile Home Commission Act (Act 419, P.A. of 1976) defines state agency responsibilities for regulating mobile home parks. Although the Michigan Department of Commerce has overall responsibility for the review and approval of plans to establish new mobile home parks, the Michigan Department of Public Health is specifically responsible for the review and approval of stormwater facilities. Rules pertaining to mobile home parks have been adopted by both the Department of Commerce and the Department of Public Health.

According to the rules of the Michigan Department of Public Health, mobile home park plans must provide for the removal of excess stormwater for a 10-year frequency storm. If the receiving stream does not have the capacity for receiving the stormwater, either the receiving stream is enlarged or a retention/detention facility is provided. The approach taken to removal of stormwater from the site is the decision of the landowner. The Department of

Public Health does not have specific requirements for the design of retention basins.

The Mobile Home Commission Act provides drain commissioners the option of approving outlet drainage from mobile home parks. As stated in the Act, the drain commissioner "must review and may approve outlet drainage for mobile home parks" in accordance with adopted regulations. A review of the interior drainage scheme is prohibited, however, unless the drainageways and facilities are dedicated to the public. The Oakland County Drain Commissioner utilizes subdivision plat review standards for mobile home park reviews since specific mobile home park standards have not yet been adopted. Discharge of stormwater is limited to an agricultural rate of discharge (0.2 cfs/acre) unless discharge is to an adequate outlet. The discharge limitation typically leads to the provision of on-site retention. The Drain Commissioner reviews retention basin designs to assure adequate capacity, but does not review plans for carrying stormwater to the retention facility.

The law also provides for an optional drainage review by municipalities. Municipalities may grant preliminary approval of mobile home park plans if the plans comply with local laws, including drainage laws. If local standards are more restrictive than state standards, however, the standards must be approved by the Mobile Home Commission to affect mobile home parks. The practical result of this requirement is that stormwater drainage from mobile home parks is reviewed and approved by the Oakland County Drain Commissioner and the Michigan Department of Public Health -- not the local municipality.

Maintenance of retention facilities within mobile home parks is the responsibility of the property owner. Due to maintenance problems such as weeds and mosquitoes, the Department of Public Health prefers detention basins which are dry at most times.

ASSESSMENT OF STATE AND FEDERAL PROGRAMS AFFECTING STORMWATER MANAGEMENT

Present state and federal programs do not provide a comprehensive institutional framework for stormwater management in Southeast Michigan. Although individual programs provide for the management of certain resources (such as floodplains, wetlands, and soil resources), state and federal agencies do not have programs for the review and approval of permanent stormwater facilities directed toward stormwater quality and quantity control. The Subdivision Control Act provides a framework for the review and approval of subdivision plats by state, county, and local agencies, but does not specify the review criteria or standards to be used, apart from "adequate stormwater facilities."

Nevertheless, the effects of state permit requirements on stormwater quantity control or stormwater quality should not be disregarded. Although they do not provide a comprehensive framework for stormwater management, they do provide important environmental protection. The following state regulations are particularly important for stormwater quality management:

- Michigan Erosion and Sedimentation Control Act -

  Although this law is directed toward controlling erosion during site

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construction, it does require the review and approval of permanent stormwater control facilities (such as retention and detention basins) to insure a "nonerosive" velocity.

- Inland Lakes and Streams Act -

  Many detention basins which are designed to have standing water (permanent lakes or ponds) are subject to permit requirements. Although a comprehensive review of proposed basins is not conducted, a review of harmful downstream effects, including water quality problems, is made.

- Goemaere-Anderson Wetlands Protection Act -

  Many wetlands which have stormwater retention and purification values are subject to state permit requirements. The administration of this law should help to control stormwater runoff quality and quantity.

As described in later chapters of this report, only the regulations of the Drain Commissioner together with local governments potentially provide a comprehensive framework for controlling stormwater runoff from development sites for water quality and water quantity purposes.

Whether there is, in fact, a gap in present state and federal agency programs which should be remedied depends upon a person's point of view of county and local government stormwater management programs. If county and local programs are seen as effective and comprehensive in controlling stormwater for quantity and quality purposes, additional state and federal programs in Southeast Michigan are not needed. County and local programs are summarized and reviewed in the chapters which follow.

CHAPTER III

OAKLAND COUNTY STORMWATER MANAGEMENT PROGRAMS

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INTRODUCTION

The Oakland County Drain Commissioner and the Oakland County Road Commission administer programs which affect stormwater management throughout Oakland County. In addition to the construction and maintenance of storm drains, the Drain Commissioner reviews all subdivision plats to assure proper drainage and stormwater management and approves proposed connections to county drains. The Oakland County Road Commission reviews subdivision plats to insure that street and road requirements of the county are met, including provision for roadside drainage. The Road Commission also controls all discharges to county road drains.

Other programs of the Oakland County Drain Commissioner which affect stormwater include administration of the Michigan Soil Erosion and Sedimentation Control Act within many local jurisdictions, and the operation of structures to maintain inland lake levels.

County programs related to stormwater management are described according to the following program areas:

1. Programs of the Oakland County Drain Commissioner:
    - Storm Drain Design and Construction;
    - Storm Drain Connection Permits;
    - Stormwater Facility Operation and Maintenance;
    - Subdivision Plat Review and Approval;
    - Erosion and Sedimentation Control Permits; and
    - Regulation of Inland Lake Levels and Improvements.
2. Programs of the Oakland County Road Commission:
    - Subdivision Plat Reviews for Roadside Drainage; and
    - Road Drainage Connection Permits.

Each of these programs is outlined below with requirements related to stormwater quality emphasized. The relationship of county programs with local government stormwater management activities is also indicated.

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As used in this report, Oakland County Drain Commissioner refers to the Office of the Oakland County Drain Commissioner.

PROGRAMS OF THE OAKLAND COUNTY DRAIN COMMISSIONER

Storm Drain Design and Construction

The Michigan Drain Code (Act 40, P.A. of 1956) gives the Drain Commissioner authority to design and construct storm drains at the request of local governments or landowners. Drain construction projects may not be initiated solely at the discretion of the Drain Commissioner, a factor which somewhat limits the office's ability to plan and implement a county-wide stormwater drain system.

The Drain Code includes specific procedures which must be followed before a drain construction project is initiated. For example, if a Chapter 20 drain is proposed (in accordance with provisions of Chapter 20 of the Drain Code), local governments affected submit a petition to locate, establish, and construct a county drain. The petition must state that the drain is necessary for public health and must describe the location and route of the drain. A drainage board is then formed and appropriate meetings and studies carried out. The primary purpose of storm drain construction projects is to remove stormwater from the site -- often to correct existing problems and reduce hazards.

The Michigan Drain Code provides a role for the State related to storm drains and water pollution. If the Michigan Water Resources Commission (through the Michigan Department of Natural Resources) determines that sewage or wastes carried by an existing county or intercounty drain constitute an unlawful discharge as defined in Section 6 of the Water Resources Commission Act (Act 245, P.A. of 1929, as amended), an order may be issued to the Drain Commissioner calling for the construction of appropriate measures to abate the pollution. In such cases, the Water Resources Commission must determine that one or more users of the drain are responsible for the discharge of sewage or other wastes. Because it is often difficult to pinpoint the geographic origin of pollutants contained in stormwater, it is difficult for the Water Resources Commission to take action on stormwater concerns. For this reason, the efforts of the Oakland County Drain Commissioner to reduce the effects of stormwater carrying pollutants and storm drain construction on water quality are extremely important.

Section 280.423 of the Michigan Drain Code charges the Oakland County Drain Commissioner with certain responsibilities related to storm drain construction and water quality. As stated in this section, a municipality, individual, or other entity must not discharge into any county or inter-county drain any sewage or waste matter "capable of producing in the drains detrimental deposits, objectionable odor nuisance, injury to drainage conduits or structures, or such pollution of the water of the state receiving the flow from the drains as to injure livestock, destroy fish life or be injurious to public health....Disposal plants, filtration beds, and other mechanical devices as will properly purify the flow of any drain may be constructed and become part of any established drain." This provision is directed toward control of sewage in storm drains. Requirements for the control of pollutants carried in stormwater runoff are not specified in the Drain Code.

In addition to the construction and improvement of storm drains, the Michigan Drain Code makes it possible for drain commissioners to assume jurisdiction over a river, creek, or floodplain for public health purposes. A petition must be received which describes the conditions which could cause or increase flooding, pollution or other problems, and must indicate the type of actions or procedures necessary to remove or lessen the danger. This provision makes it possible for the Drain Commissioner to assist landowners with existing problems or problems which could exist in the future.

The Michigan Environmental Protection Act (Act 127, P.A. of 1970) provides additional legal authority for activities of the Oakland County Drain Commissioner related to stormwater management and water quality. This state law imposes a general duty on all governmental agencies to prevent or minimize water pollution when carrying out their programs.

Water quality aspects of storm drain projects are usually not considered when the initial petition is submitted. Instead, water quality control measures are considered during detailed design and engineering. Measures which may be used in conjunction with storm drains to reduce deleterious water quality effects include retention basins and ponds at the drain inlet or outlet, submerged weir outlets in basins which retain debris, litter, and oil until skimming or vacuuming operations can be completed, and soil stabilization measures in areas where soils are disturbed by drain construction. Natural wetland areas are sometimes used to help filter pollutants from stormwater before the water reaches rivers and lakes. The costs and benefits of water quality measures are considered for each storm drain project on an individual basis. The Drain Commissioner does not have specific policies or standards and water quality measures related to storm drain construction.

The Michigan Drain Code was adopted to provide a procedure for major public works projects for storm drains. Such drains would remove stormwater from agricultural and urban areas, thereby providing lands for "more economic" uses. At the time that the Drain Code was adopted, concerns related to downstream flooding and water quality impacts had not been raised. As a result, the Michigan Drain Code does not provide a comprehensive basis for stormwater management for water quantity and water quality control purposes.

The Drain Code is a tool which may be used by drain commissioners throughout Michigan to assist local governments and landowners in their efforts to manage stormwater. The Drain Code authorizes the design and construction of storm drains -- not the management of stormwater in a comprehensive fashion. Although the Michigan Environmental Protection Act requires drain commissioners to consider environmental effects of drain construction projects, drain commissioners are not required to develop and implement a county-wide drainage system with quantity and quality control benefits.

Storm Drain Connection Permits

Any proposal to alter, connect to, or cross a designated county storm drain requires a permit from the Oakland County Drain Commissioner. Connection permits (often called "tap" permits) are intended to avoid changes in stormwater flows and structures which would increase downstream stormwater problems.

The basic requirements of the Drain Commissioner related to subdivision plat drainage are applied to applications for connection permits. Except for recent county drains, discharge of stormwater into the drain is limited to an agricultural or pre-development rate (0.2 cfs/acre). The discharge requirement, in turn, leads to on-site retention of stormwater. The Drain Commissioner reviews retention structures to assure that adequate capacity is provided. Methods and designs for conveying stormwater to the retention basin, however, are not reviewed.

Stormwater Facility Operation and Maintenance

The Oakland County Drain Commissioner carries out a storm drain maintenance program for designated county drains and retention/detention basins. At the present time, the maintenance of county drains is the focus of the program. The Drain Commissioner, however, will consider accepting maintenance responsibilities for detention/retention basins in the County, provided that an assessment district is established under provisions of the Drain Code. The fact that many basins are constructed with maintenance left to property owners is a concern of the Drain Commissioner. Except for grass cutting and other "housekeeping" maintenance, most other property owners' and homeowner associations do not have the capability of making structural repairs. Specific activities carried out by the Drain Commissioner related to stormwater facility maintenance are summarized below.

The nine member maintenance staff of the Oakland County Drain Commissioner's office (six field crew members) attempts to complete annual inspections of every large storm drain constructed since 1955 in order to assure proper hydraulic functioning. Manholes, pipes, and open ditches are examined and appropriate cleaning or repairs are made. Illegal stormwater taps are also identified. A total of forty-five bar screens located at the connection of an open drain to a closed storm sewer are also checked at least three to four times a year to assure proper functioning. During summer months, lake level control structures are inspected and materials blocking the stormwater flow are removed. The few retention/detention basins which are designated county drains have not required removal of silt or significant maintenance activities to date.

When manpower allows, maintenance is also provided on open ditch drains constructed prior to 1955. Cutting of trees and removal of brush are the major maintenance activities. Oakland County's "welfare crew" (able bodied men receiving county welfare assistance) supplements the Drain Commissioner's maintenance crew for open ditch maintenance.

Retention and detention facilities which are reviewed and approved by the Oakland County Drain Commissioner as required by the Subdivision Control Act (Act 288, P.A. of 1967) are subject to certain maintenance requirements. As stated in the Drain Commissioner's rules, "provision for maintenance of the retention basin shall be made by the developer with the subdivision association or the municipality." Specific maintenance activities (such as structural repairs or sediment removal) are not specified in the rules and are typically not itemized in agreements with developers. At the request of the landowner or the local government, the Oakland County Drain Commissioner will consider establishing a county drainage district and assessing landowners for maintenance services provided.

In three cases, subdivisions have been constructed around open ditch county drains and have incorporated in-line retention basins in the plans for the subdivision. The Oakland County Drain Commissioner entered into maintenance agreements with developers to assure proper maintenance of the in-line retention basins which remain part of the county drain system. The Drain Commissioner retains the responsibility for clearing of brush and related routine maintenance. Cutting of grass, site maintenance, and special maintenance activities are the responsibility of the homeowner association. In addition, the Drain Commissioner is reimbursed by the homeowner association for the cost of liability insurance to protect the county against damages should accidents and injuries result from the in-line retention basins. Although insurance costs are not uniform, $500,000 in liability coverage was provided for one subdivision at a cost of $600/year.

Most of the drains owned and maintained by the Oakland County Drain Commissioner are drains constructed for stormwater management purposes. In addition to the storm drains, however, the Drain Commissioner operates and maintains the combined sewer system in southeast Oakland County (owned by Oakland County). In 1972 - 1974, a pollution control retention basin was constructed to alleviate water quality problems resulting from overflows of the combined sewers during heavy storms. The retention basin is a large, underground storage basin which chlorinates water as it overflows from the connecting drains. The Drain Commissioner takes water samples and flushes the basin after overflow events. The facility is operated in accordance with standards required by the Michigan Department of Natural Resources through the NPDES permit program.

Maintenance program costs are assessed to property owners within established drainage districts. Storm drains built under provisions of Chapter 8 of the Michigan Drain Code (primarily agricultural drains constructed prior to 1955) have maintenance cost limitations ($800/drain mile/year) unless permission from property owners and local governments has been obtained in accordance with Chapter 8 procedures.

Subdivision Plat Review and Approval

The Michigan Subdivision Control Act (Act 288, P.A. of 1967) requires the Drain Commissioner to review proposed subdivision plats "to insure that adequate storm water facilities are designed." The Drain Commissioner's review is one of several county agency reviews mandated by the state law. The Oakland County Health Division, the Road Commission, and the County Plat Agency also complete reviews. Each agency reviews the proposed plat independently and submits comments to the landowner proposing the subdivision plat. Reviews by the Road Commission include provisions for roadside drainage and are summarized in a later section of this report. A single coordinating agency for subdivision plat reviews in Oakland County has not been designated.

The Subdivision Control Act enables townships, villages, and cities to adopt and administer subdivision ordinances if they choose to do so. Many local governments in Oakland County have adopted their own ordinances. Local governments consider comments from county agencies and state agencies in their reviews. Many local governments in Oakland County complete a specific stormwater management review of subdivision plats, even though they are not required to do so. Landowners must comply with requirements of state, county, and local agencies when subdivsion plats are proposed.

State agencies required by law to review preliminary subdivision plats include the Department of Transportation, the Department of Natural Resources, and the Water Resources Commission. The Michigan Department of Public Health reviews plats after they have been reviewed by county health agencies. State and county agency subdivision plat reviews may take place concurrently or consecutively, depending upon the preference of the landowner or developer. Although the Michigan Department of Natural Resources reviews the effect of proposed subdivision plats on floodplain discharge capacity, a state-level stormwater management review is not required.

As defined by the Subdivision Control Act, subdivisions are an act of division of land which creates:

- Five or more parcels, each of which is ten acres or less in area; or
- Five or more parcels, each of which is ten acres or less in an area created by the successive division of land within a ten year period.

Although most subdivisions are primarily for single-family residential developments, subdivisions for multiple-family, commercial, and industrial land uses are sometimes proposed.

The purpose of the Drain Commissioner's reviews is to alleviate and avoid flooding problems on the site and downstream. In the process of regulating stormwater management practices, however, many of the Drain Commissioner's requirements and standards provide benefits for stormwater quality.

The "Rational Method" is used for calculating the volume of stormwater runoff from the site. The preliminary subdivision development plan must include the general drainage scheme, indicating how drainage will be provided and the location of the outlet. Drainage originating outside of the subdivision limits as well as natural water courses and county drains must be shown. Drainage easements must be designated for all stormwater facilities. In cases where concentrated stormwater is discharged into an undersized drain on adjoining private property, an improvement to the drain and/or an agreement or easement with the property owner is required.

Many of the regulations which are followed in reviewing subdivision plats are included in a document titled "Procedures and Design Criteria for Subdivision Drainage in Oakland County." The intent of the document is to provide developers with specific information about drainage requirements which will be enforced by the Drain Commissioner. At present, however, the written regulations do not completely reflect all of the policies which are administered. The Drain Commissioner has plans to revise and update the "procedures" document in the near future.

Major policies and standards followed by the Oakland County Drain Commissioner in the review of subdivision plats are listed below. Policies and regulations which are included in "Procedures and Design Criteria for Subdivision Drainage in Oakland County" are marked (*). Selected policies for retention basins; natural infiltration of stormwater; lot grading; and soil erosion, sedimentation, and pollution control; are listed, since these categories typically have benefits for water quality.

Retention and Detention Basins:

* 1. On-site retention will be required if the storm drain outlet is incapable of handling the developed runoff. (Because runoff to streams in locations other than the Clinton River, the Rouge River, certain large lakes, and recent county drains are likely to create flooding problems downstream, on-site retention is required in many subdivision developments).

* 2. The allowable outflow from a retention basin shall be restricted to agricultural runoff, which is defined as 0.2 cfs/acre.

* 3. The volume provided for a detention basin with an outlet must be equal to or exceed that required by the Oakland County Drain Commissioner's "Simplified Retention Basin Design Procedure" for a 10-year frequency storm. The volume provided for a retention basin without an outlet must accommodate runoff from two recurring 100-year storms of maximum duration. (The difference between a 10-year and 100-year frequency stormwater volume is 57 percent.)

* 4. All in-line basins (connecting at the inlet and outlet with a county drain or watercourse) must have a control structure capable of passing the upstream 10-year stormflow.

* 5. All retention basins must have provision for an overflow.

* 6. All retention basins should have a positive method in which to be dewatered such as a gravity flow or pump outlet.

* 7. Retention volume on a gravity outflow retention basin is defined as "the volume of retention provided above the invert of the outflow pipe." Any volume provided below the invert of the outflow pipe will not be considered as retention.

* 8. Retention volume must be provided for all acreage contributing to the retention basin, including that acreage offsite.

* 9. Provision for maintenance of the retention basin shall be made by the developer with the subdivision association or the municipality.

*10. The bottom of all retention basins shall be graded in such a manner as to provide positive flow to the pump or pipe.

*11. One foot of freeboard shall be provided above the 10-year water elevation.

*12. Fencing will be required as needed, depending upon basin steepness of side slopes, etc.

*13. All retention basins must be permanently stabilized to prevent erosion.

14. Basins which are usually dry are the preferred approach to retention. Retention basins with standing water may be approved if adequate provisions are made for maintenance.

Natural Infiltration of Stormwater:

1. Natural infiltration of stormwater (using depressions, swales, wetlands, and grassed areas) is an acceptable alternative when soils and site conditions are suitable.

2. The major technical consideration in the review of proposals for natural infiltration is the rate of infiltration of stormwater into the soils and groundwater. Natural areas should absorb water at a rate which does not encourage the growth of weeds or allow pools of standing water.

3. In areas where excessive sedimentation is expected (such as during construction), natural areas should not be used for stormwater retention. The sediment can be unsightly and prevent the use of the natural area for recreation and scenic enjoyment. Shallow swales may be useful for stormwater conveyance but may rapidly silt up and lose their effectiveness.

* 4. Open ditches are allowed in rural areas where sufficient land is available and where maintenance easements can be provided. A flow of one foot/second velocity is required to avoid rapid silting of the storm drain and reduce the potential for standing water.

* 5. In general, leach basins will not be recognized as an acceptable method of providing adequate storm drainage. (Leach basins are small subsurface holes, such as dry wells, which receive small amounts of stormwater and allow natural infiltration into the soils and groundwater). Exceptions may be made in cases where leach basins will function properly and not create overflow hazards. In most cases, leach basins do not provide stormwater retention volume for the 10-year frequency storm.

* 6. Stormwater retained in depressions and swales should not be considered in calculating retention and detention basin holding requirements.

Lot Grading:

* 1. The grading of the lot shall be such that surface runoff is away from homes and towards swales, ditches, or drainage structures. Provisions for drainage either by filling and grading or by providing some type of outlet must be made for all areas within the proposed subdivision.

* 2. Where finished grades indicate a substantial amount of drainage across adjoining lots, a drainage swale of sufficient width, depth, and slope must be provided on the lot line to intercept this drainage.

* 3. Lots that lie within the floodplain of a stream must be filled to a sufficient elevation to conform to the adjacent area which is not subject to flooding, and shall satisfy the floodplain requirements of the Michigan Department of Natural Resources. In no case, will the filling of a lot be permitted if the floodplain is so restricted as to cause possible flooding or backup of the stream.

Soil Erosion, Sedimentation, and Pollution Control:

* 1. Headwalls, grouted riprap or slope paving must be provided where necessary to prevent erosion.

* 2. Structures specially designed to remove silt, trash, oil, grease and other debris must be installed as required at storm drain outlets to lakes.

* 3. Erosion protection must be placed at bends, drain inlets and outlets, and other locations as required in all open ditches.

* 4. Every effort should be made to reduce the velocity of flow as much as possible at all storm drain outlets.

* 5. A manhole sump or catch basin outleting to a lake as a minimum method of erosion protection.

* 6. The smallest practical area of raw land should be exposed at one time during development. The exposure of raw land should be kept to the shortest practical period of time.

* 7. Sediment basins, where needed (debris basins or silt traps) should be installed and maintained.

* 8. The development plan should be fitted to the topography and soil so as to create the least erosion potential.

* 9. Wherever feasible, natural vegetation should be retained and protected.

Other policies for subdivision plat review by the Oakland County Drain Commissioner relate to enclosed storm drains. Storm drain requirements related to water quality protection are referenced in the soil erosion section, as listed above. The Oakland County Drain Commissioner does not require underground enclosed drains in subdivision developments, although this is the typical practice followed by developers when enclosed drains along county roads are required by the Oakland County Road Commission.

The Oakland County Drain Commissioner carries out the subdivision plat review through a three-step process. As the first step, a review of the preliminary plat (a one-page drawing of the subdivision layout illustrating topography, water courses, and drains) is reviewed. The second step is the review of construction plans with detailed engineering specifications. The final plat review and approval consists of a final check to assure that provisions approved in construction plans have been included in the final subdivision plat.

After construction plan approval, the Drain Commissioner transmits a letter indicating the conditions of the plat approval to the local government. Copies of the letter are also sent to the consulting engineer, the developer, and the Oakland County Road Commission. The letter typically states that all drainage facilities must be properly installed and continually maintained. Developers are required to make arrangements for facility maintenance with homeowner associations, the municipality, or the Drain Commissioner.

On-site inspection and enforcement to insure that storm drainage facilities are properly installed is the responsibility of local governments. Site inspections during and after installation are not carried out by the Oakland County Drain Commissioner, except for county-owned or operated drainage facilities.

Fees charged to subdivision plat approval applicants cover the cost of the Drain Commissioner's technical reviews. For subdivisions under one hundred acres in size, permit fees range from $150 to $625 per subdivision.

The purpose of the subdivision drainage review by the Oakland County Drain Commissioner is water quantity control -- not water quality. A number of the practices required, however, have positive water quality benefits. On-site retention and detention of stormwater, for example, is a practice with important water quality benefits in many cases. The retention and detention methods emphasized by the Oakland County Drain Commissioner -- namely construction of basins and natural infiltration -- have water quality benefits.

Any amount of stormwater discharged from a site into a receiving stream or lake adds to downstream flows and can also carry pollutants downstream. Although downstream effects are considered by the Oakland County Drain Commissioner in a general way when subdivision plats are reviewed, specific studies related to downstream impacts or cumulative impacts are not made. Since on-site retention of stormwater with discharges limited to an agricultural rate (0.2 cfs/acre) is frequently required, downstream effects are greatly reduced.

The Oakland County Drain Commissioner considers natural infiltration of stormwater (through the use of depressions, lowland, and wetland areas) to be an acceptable approach to on-site stormwater management, provided that nuisances such as standing water and muddy areas are not created. In many cases, developers propose the use of lowland areas for natural stormmwater detention in order to make efficient use of the land. Swales or grassed channels may be used for transporting the stormwater to the natural retention area. Although the Drain Commissioner's review focuses on stormwater quantity control, the use of natural on-site detention areas has important water quality benefits. Soils have the capability of removing many pollutants from stormwater, and natural infiltration prevents the pollutants from reaching surface waters.

Lot grading requirements of the Drain Commissioner are directed toward the prevention of flooding on adjoining property. The policies followed do not have particular water quality benefits, except when they result in the use of swales or on-site drainage and stormwater retention.

The soil erosion, sedimentation, and pollution control requirements administered by the Drain Commissioner are directly related to water quality. The policies are intended to reduce the overall erosion potential from the development as well as to minimize erosion when stormwater control facilities are installed. Since the Oakland County Drain Commissioner reviews subdivision plats at an early stage in the subdivision plat review and approval process, the incorporation of erosion control policies into subdivision plat reviews is particularly important. Revisions in site layout to minimize erosion potential may be feasible at the early stages of the development review process but difficult at the later stages. Many developers delay their application for a soil erosion and sedimentation control permit until the end of the approval process.

A number of local governments in Oakland County (especially rural townships) depend upon the technical review by the Oakland County Drain Commissioner to identify significant drainage and erosion problems related to subdivision plats. In addition, local staff and consulting engineers sometimes utilize the review standards of the Drain Commissioner when completing their own subdivision plat and site plan reviews. The Drain Commissioner also provides advisory assistance to local government site plan reviews on a request basis. At present, site plans for Pontiac Township, Avon Township, White Lake Township, and Orion Township are reviewed on a regular basis. The adopted subdivision plat review standards are used when completing advisory site plan reviews. In summary, the stormwater standards and policies of the Oakland County Drain Commissioner have a far reaching effect on development practices, stormwater flows, and water quality in Oakland County.

The Oakland County Drain Commissioner considers the provision of adequate maintenance for retention and detention facilities to be an essential factor for all developments. Provision for maintenance of retention/detention basins must be provided by the developer with the subdivision association, municipality, or the Drain Commissioner.

Soil Erosion and Sedimentation Control Permits

The Oakland County Drain Commissioner is responsible for the administration and enforcement of the Michigan Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972) in many areas of Oakland County. Provisions of the Act are enforced in all local government jurisdictions which do not have an ordinance in effect conforming to state requirements. (Only villages, cities and charter townships have the option of developing their own soil erosion and sedimentation control ordinance).

The following local governments administer their own permit programs for erosion control:

- City of Berkley;
- City of Birmingham;
- City of Farmington Hills;
- City of Lathrup Village;
- City of Pontiac;
- City of Novi;
- City of Southfield;
- City of Troy;
- City of Wixom;
- City of Lake Angelus;
- Village of Milford;
- Village of Wolverine Lake; and the
- City of Walled Lake.

The Oakland County Road Commission is also a designated enforcement agency responsible for reviewing activities carried out by the Road Commission, which are subject to the state requirements.

The rules of the Michigan Department of Natural Resources for soil erosion and sedimentation control specify that permits are required for certain earth change activities which disturb one or more acres of land or fall within five hundred feet of a lake or stream. The Oakland County Drain Commissioner requested a revision in the rules to alleviate unnecessary paperwork and expense. The requested revision was approved by the Michigan Department of Natural Resources and became effective October 1, 1977.

The Michigan Department of Natural Resources issued declaratory rulings which authorized the Oakland County erosion and sedimentation control program to be modified as follows:

1. Permits on individual projects of less than one acre will be issued only when the disruption is within 100 feet of a lake or stream.

2. Permits on individual lot development in subdivisions platted after January 1, 1975 will only be issued when the disruption is within one hundred feet of a lake or stream.

3. An option will be retained to issue a permit for a disruption of less than one acre and more than one hundred feet from a lake or stream if it is determined by either the Oakland County Drain Commissioner or the local jurisdiction that circumstances warrant a permit review. Such circumstances might be the improper installation and maintenance of the protective measures specified under the overall subdivision permit, or a determination that the slope, soil conditions, and disruption pose an erosion threat to the State's waters.

In all cases, however, projects which are one acre or more in size are subject to erosion and sedimentation permit requirements. These changes substantially reduce the paperwork and clerical duties associated with permits on sites which are not prone to erosion.

The purpose of the erosion control program is to prevent off-site sedimentation and erosive velocities from runoff during construction. The Oakland County program attempts to keep water carrying sediment from leaving the construction site. The program focuses on the control of erosion and sedimentation during construction and on the stabilization of the area following construction activities.

The state law and the rules of the Michigan Department of Natural Resources require landowners to prepare an erosion and sedimentation control plan if a permit is required. The sedimentation control plan is then submitted to the enforcing agency for approval. The control plan must describe the proposed earth change, existing and proposed on-site drainage facilities, proposed temporary soil erosion control measures, proposed permanent soil erosion control measures, and a maintenance program for facilities remaining after project completion. If the erosion and sedimentation control plan is approved, a permit is issued.

Changes in the natural cover or topography of the land (called earth changes) must be designed, constructed, and completed in such a manner that the exposed area of land is limited to the shortest possible period of time. The following land use activities are subject to the permit requirements:

- Transportation facilities, including streets and highways;
- Residential subdivisions, mobile home parks, multiple housing, and site preparation for single family residences;
- Industrial and commercial development;
- Service facilities, including but not limited to parks and campgrounds;
- Oil, gas, and mineral wells in certain cases; and
- Water impoundments and waterway construction (including ponds).

In some cases, landfills are subject to permit requirements.

The Oakland County Drain Commissioner and the Oakland County Soil Conservation District have prepared a guidebook titled "Erosion and Sediment Control Design Criteria" to assist engineers preparing soil erosion and sedimentation control plans. In reviewing erosion and sedimentation control plans, the Drain Commissioner emphasizes the sequence of construction related activities. Initial construction is the most critical time for erosion control.

Typical temporary erosion control measures encouraged by the Oakland County Drain Commissioner include straw bale berms around the perimeter of the site, stone filters over catch basins, and vegetated swales to direct runoff to appropriate locations. Since retention or detention basins are often required by local governments or the Drain Commissioner for stormwater management after construction, many developers complete retention/detention basin construction as a first step and then use the basin as a sedimentation basin until construction is completed. The Drain Commissioner requires the removal of sediment from basins after construction is completed in order to assure proper functioning for stormwater management on a permanent basis. Specially constructed sediment basins which are removed after construction are employed in less than five percent of all Oakland County development projects.

As required by the rules of the Michigan Department of Natural Resources, the Drain Commissioner reviews plans for permanent erosion control measures. The Drain Commissioner discourages structural measures such as storm drain filters and standpipes for sediment control purposes on a permanent basis since maintenance of such devices is very difficult. If a developer insists on permanent structural measures for environmental or other reasons, the fact that it is the developer's decision to include such measures is noted on the permit. The Drain Commissioner requires final grading, stabilization of the ground cover (usually through vegetation), cleaning of drains, and the removal of temporary erosion control measures as part of the permit conditions. Erosion control facilities which require maintenance after construction are discouraged.

Soil erosion permit fees are based upon the cost of certain earth disturbing activities (such as grading, storm drainage, sewer and water systems, paving, and erosion control/vegetative stabilization). Permit fees range from $10.00 to several thousand dollars. In addition, a bond or letter of credit equal to three percent of the costs of site preparation (between $1,000 and $10,000) is required. The bond is returned when construction on the site has been properly completed.

Because of the permit fees and bond requirement, many developers do not apply for the erosion and sedimentation control permit until many other local and county approvals have been obtained. By law, however, the erosion and sedimentation control permit must be obtained before the local government issues the building permit.

Because of this sequence, the Drain Commissioner's subdivision plat review (for stormwater management purposes) becomes an important review for erosion control as well. For subdivisions, the drainage review can be used to identify changes in layout which will reduce overall erosion from the site during construction. For site plans, the local government grading plan review can also serve this purpose. In most cases,the erosion and sedimentation permit review carried out by the Drain Commissioner addresses measures to reduce erosion and sedimentation, given the overall layout of the project.

In summary, the erosion and sedimentation control permit program of the Oakland County Drain Commissioner has direct benefits for water quality. Both off-site erosion and stormwater runoff are controlled through the program. Because retention/detention basins needed for long-term stormwater control are often constructed prior to the initiation of grading and basic construction activities, stormwater discharge from the site during construction is often minimized as well. Although exposed soils are stabilized before erosion control bonds are returned, erosion control facilities which require maintenance after construction are discouraged.

Enforcement of permit requirements is the responsibility of the Oakland County Drain Commissioner. Two inspectors complete the work throughout the County. Inspection and enforcement activities are directed to sites where potential erosion problems are the greatest. Each site, however, typically is reviewed three times during the construction period.

Because of the small number of inspectors, assistance and support from local governments is needed. Although local governments should not undertake the detailed inspections which are the Drain Commissioner's responsibility, it is important for local governments to notify the county when obvious violations are taking place.

Copies of the soil erosion permit issued by the County are sent directly to the local government. In addition, many developers give local governments copies of the actual soil erosion and sedimentation control plan (as approved by the Drain Commissioner) as part of the set of construction drawings. In some cases, local governments review the detailed requirements of the sedimentation control plan in order to provide further monitoring assistance to the Drain Commissioner.

When enforcing the provisions of the Erosion and Sedimentation Control Act, the Drain Commissioner seeks the assistance of local governments. Revocation of the building permit by the local government is an effective enforcement measure. As a backup provision, the funds in the bond may be used to correct damage on the site.

Regulation of Inland Lake Levels and Improvements

In accordance with the Inland Lake Level Act (Act 146, P.A. of 1961), the Drain Commissioner has been designated by the Oakland County Board of Commissioners as the agency responsible for lake level operations. The Board of Commissioners may act on their own or in response to a petition from property owners abutting a lake. The Board may request a court determination of appropriate lake levels when necessary for health, welfare, safety, or conservation of natural resources. The Drain Commissioner constructs and maintains structures such as dams which may be needed to maintain the water levels. The Board of Commissioners is responsible for determining the method of financing lake level maintenance activities, and may create a special assessment district including all land parcels benefited by the establishment of a lake level.

There are forty-two lakes in Oakland County, including some manmade lakes constructed specifically for stormwater retention purposes, which are subject to the lake level program. In these cases, the Drain Commissioner is responsible for the maintenance of lake levels. In addition to assuring the continued retention capability of the lakes, the regulation of lake levels helps to support the natural ability of adjacent wetlands to filter and purify runoff from the land.

A second state law related to inland lakes, the Inland Lake Improvement Act (Act 345, P.A. of 1966), authorizes the establishment of lake boards which may dredge and remove undesirable materials from lakes. Local units of government, either at their own initiative or at the request of property owners, may establish the lake board. Members of the board must include representation from the Board of County Commissioners, a representative of each local unit of government, the County Drain Commissioner, and a representative of the Michigan Department of Natural Resources.

The Board of County Commissioners may provide up to 25 percent of the cost of a lake improvement project on any public inland lake (accessible to the public). A special assessment district including properties benefiting from the project may also be created to pay for the costs of the project.

The Oakland County Drain Commissioner provides technical assistance to lake boards and assists with operations. This law provides a mechanism for making major improvements in lakes, including removal of silt, weed removal, and other activities related to water quality.

PROGRAMS OF THE OAKLAND COUNTY ROAD COMMISSION

Subdivision Plat Reviews for Roadside Drainage

The Michigan Subdivision Control Act (Act 288, P.A. of 1967) requires the Oakland County Road Commission to review and approve subdivision plats for conformance with published rules and regulations. The Board of County Commissioners adopts regulations which pertain to streets, roads, alleys and highways under Road Commission jurisdiction. Drainage is one of many components subject to review by the Oakland County Road Commission.

In newly platted subdivisions where the lots are "normal" in terms of lot area, concrete curb and gutters meeting Road Commission standards are required. This requirement automatically leads to the provision of an underground storm drainage system by the developer. The outlet of such a system may be a retention or detention basin, lowlands or wetlands, natural drainage swales, or an existing storm drainage system. The Road Commission has found that this requirement is supported by local communities and residents since it avoids problems which tend to occur in urban areas (such as ditches being filled in by lot owners).

Open ditch drainageways adjacent to county roads are permitted for "large lot" plats where lots are at least one and a half acres in size with at least 200 feet of frontage. The flow rate, type of terrain, and side-slope permitted are determined in conjunction with the Oakland County Drain Commissioner.

The option of open ditch drainageways in large lot subdivisions is of note because of the resulting water quality benefits. The stormwater flow in open ditches is typically slower than in enclosed pipes. Removal of sediments and infiltration of stormwater into soils and groundwater are facilitated.

The Road Commission requires a 60-foot right-of-way for county roads. If drainageways are not included in the right-of-way, easements must be provided by the developer. The Road Commission maintains open ditch and enclosed drains adjacent to county highways.

The Oakland County Road Commission has allowed variances in the drainage requirements to allow open ditches when needed for water quality purposes.

County Road Drainage Connection Permits

The Oakland County Road Commission requires permits for all connections or "taps" to storm drains along county roads. Although the Road Commission does not have adopted rules, regulations, or policies concerning requirements for connections to roadway drains, a uniform set of technical standards are followed by engineers reviewing permit applications.

The Road Commission is in the process of revising rules related to roadway drains (called "Rules, Standards and Procedures for Driveways, Banners and Parades Upon or Over Oakland County Road Commission Right-of-Way"). It is expected that the following rule will be approved in the near future:

> "Drainage from adjacent parking or storage areas or private property in excess of assumed agricultural runoff shall not be discharged directly into the road drainage system."

This rule reflects the fact that in nearly all cases, road drains do not have the capacity to receive stormwater runoff at rates in excess of agricultural rates (0.2 cfs/acre). Each development proposal to discharge to county road drains will, however, be reviewed on its own merits.

The Road Commission's technical requirements focus on the size of the outlet -- not the method used for stormwater conveyance or storage on the site. Nevertheless, the Road Commission's discharge requirements lead to the provision of on-site retention of stormwater. To provide for the restricted discharge of stormwater, landowners usually detain stormwater in parking lots or provide retention/detention basins.

The Road Commission connection permit requirements apply to storm drains (open and closed) along county road rights-of-way. The Michigan Department of Transportation administers their own connection permit program for storm drains adjacent to State highways. In general, the State requirements are more restrictive than the Oakland County Road Commission standards.

ASSESSMENT OF COUNTY STORMWATER MANAGEMENT PROGRAMS

The Oakland County Drain Commissioner and the Oakland County Road Commission play important roles in creating a county-wide institutional system for stormwater management. Although there is no single county agency with the authority to coordinate all storm drain projects and regulations, there appear to be no significant conflicts between the requirements of the Drain

Commissioner and the Road Commission in Oakland County. Both offices restrict stormwater runoff from development to agricultural discharge rates (0.2 cfs/acre) in many instances, a requirement which typically leads to the on-site retention or detention of stormwater.

As required by the Michigan Subdivision Control Act, final approval of subdivision plats may not be granted by local governments without the review and approval of the Road Commission and the Drain Commissioner. Whereas the Road Commission's stormwater review focuses on roadway drainage, the Drain Commissioner's review focuses on all aspects of drainage within the subdivision. Although certain regulations benefit water quality, the Road Commission and the Drain Commissioner direct their reviews toward water quantity control for flood prevention purposes.

Subdivision drainage requirements and standards of the Oakland County Drain Commissioner influence local government standards used for site plan and subdivision plat reviews. Many local government officials regard the Drain Commissioner's Office as the office with the expertise as well as legal authority to handle all stormwater and drainage-related questions. In some cases, local governments look to the Drain Commissioner for guidance on development plan reviews and, in other cases, local governments complete their own stormwater engineering reviews for subdivision plats and compare their findings with those of the Drain Commissioner.

Since the Oakland County Drain Commissioner administers erosion and sedimentation control permit requirements in all townships and many villages and cities of the County, the Drain Commissioner directly affects stormwater quality during site construction. Developments which are one acre or more in size or within 100 feet of a lake or stream are always subject to erosion and sedimentation control permit requirements. Developments within 100-500 feet of a lake or stream may be subject to permit requirements as well.

Through the Michigan Drain Code, the Drain Commissioner has legal authority to construct, operate, and maintain storm drain facilities (including detention/retention facilities) at the request of landowners or the local government. The Drain Code, however, does not provide a mandate to construct certain types of facilities for particular puposes. It is the responsibility of local governments working in cooperation with the Drain Commissioner to develop program directions which meet local needs.

In summary, Oakland County's stormwater management programs indicate that a county-wide institutional framework potentially exists for stormwater management. The following factors somewhat limit the extent of the county-wide system:

- The Drain Commissioner does not have a clear mandate to plan stormwater facilities on a county-wide basis unless specific project requests are made by local governments or property owners.
- Subdivision plat review and approval requirements do not apply to site plans. Many commercial and industrial developments are subject to site plan review requirements at the local government level but are not subject to a review and approval by the Drain Commissioner. As documented in later sections of this report, however, this concern is

alleviated by the fact that many local governments implement drainage and stormwater management requirements which reflect requirements of the Drain Commissioner.

- The Drain Commissioner and the Road Commission administer independent county-level regulations which affect stormwater runoff.

If the Oakland County Drain Commissioner chooses to require stormwater management practices with both water quality and water quantity benefits, the effect on stormwater practices throughout the County would be substantial.

CHAPTER IV

LOCAL GOVERNMENT STORMWATER MANAGEMENT PROGRAMS IN OAKLAND COUNTY

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CHAPTER IV

LOCAL GOVERNMENT STORMWATER MANAGEMENT PROGRAMS IN OAKLAND COUNTY

LOCAL GOVERNMENT STORMWATER MANAGEMENT

Local governments have legal authority to regulate development activities for purposes of health, safety and welfare protection. Zoning and subdivision regulation enabling legislation, supplemented with provisions of the Michigan Environmental Protection Act, provide legal authority for the regulation of stormwater facilities in proposed developments for both quantity and quality control. Through the City or Village Zoning Act (Act 207, P.A. of 1921) and the Township Rural Zoning Act (Act 184, P.A. of 1943), local governments may adopt ordinances which provide for review of stormwater facilities for site plans, plot plans, and other development proposals. The Subdivision Control Act (Act 288, P.A. of 1967) allows local governments to adopt ordinances providing for the review of stormwater management aspects of subdivision plats, among other items. The Michigan Environmental Protection Act (Act 127, P.A. of 1970) supplements these laws by placing a duty on organizations and individuals to prevent or minimize environmental degradation while carrying out normal activities.

The findings in this chapter are based on a telephone survey of twenty townships and fifteen cities in Oakland County (Figure 2). The local government survey was conducted in October-November, 1980. Initial contacts were made with the clerk, building inspector, engineer, or manager of each municipality. In several cases, interviews with the townshp supervisor provided the primary source of information. Community planners and other specialists were contacted in some cases. Open-ended interviews were completed to identify major program activities related to stormwater planning, regulation, and operations/maintenance. Copies of adopted regulations and standards were obtained. Interviews focused on local government activities and requirements related to on-site retention and detention, open space preservation, erosion and sedimentation control, and stormwater facility maintenance. Based upon the telephone interviews, a written summary of each local government stormwater management program was prepared and returned to persons interviewed for corrections and additions. Stormwater management program summaries for each local government are included in the Appendix and Tables 1 and 2. Persons contacted in each local area are also indicated.

This chapter reviews the extent to which legal authority for stormwater management has actually been exercised by local governments in Oakland County. The primary stormwater management activity is the review and approval of development plans. Stormwater management concerns and potential drainage problems are typically addressed before local governments approve site plans or subdivision plats. A few local governments carry out planning activities related to stormwater management. In addition, a few local governments own or maintain stormwater retention facilities. In many communities, maintenance of

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FIGURE 2

LOCAL GOVERNMENT JURISDICTIONS IN OAKLAND COUNTY

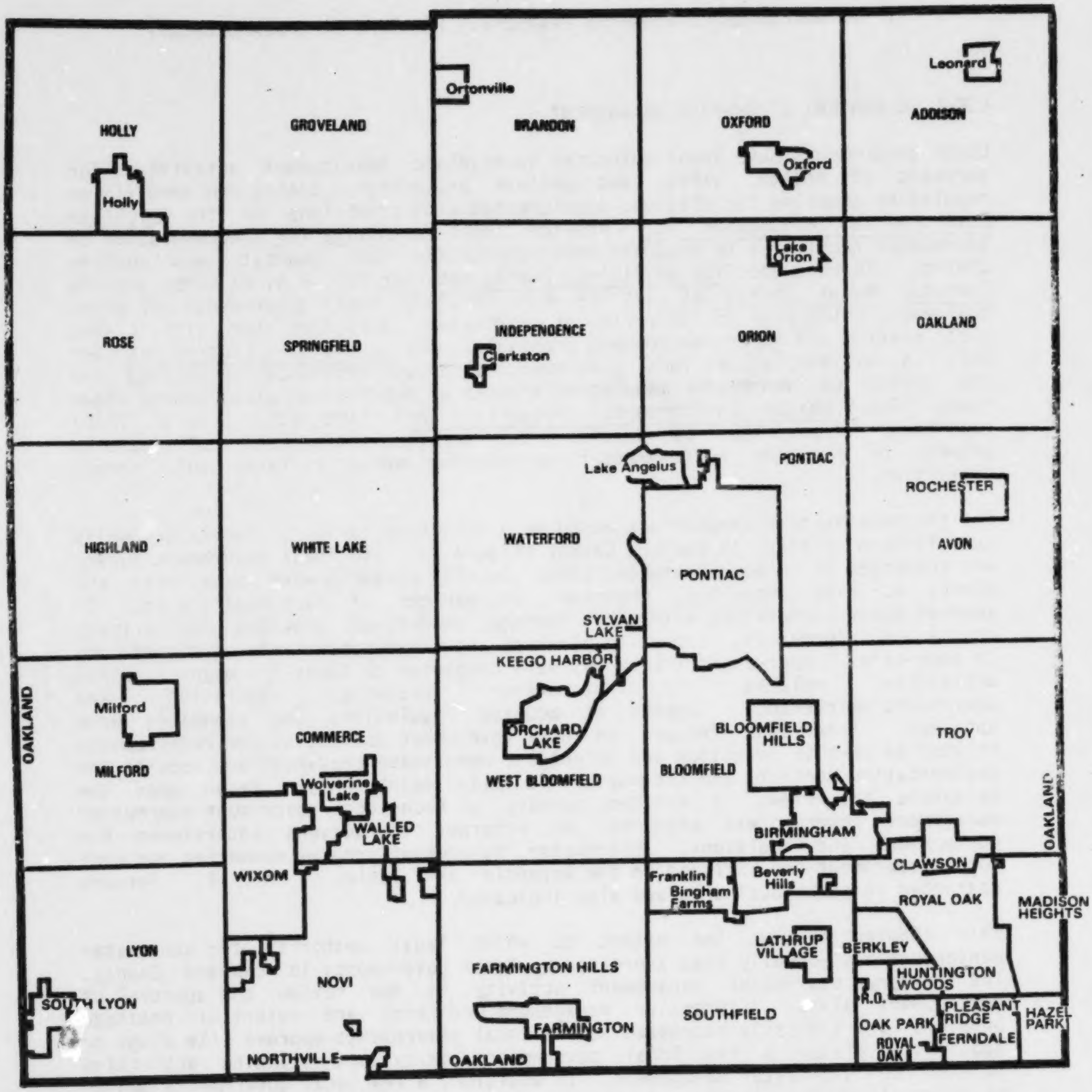

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TABLE 1

OAKLAND COUNTY TOWNSHIPS
DEVELOPMENT REVIEW POLICIES WHICH BENEFIT STORMWATER QUALITY

	On site retention with agricultural rate of discharge	Capacity for 10-year frequency storm	Capacity for 100-year frequency storm or more	Homeowner association responsible for basin maintenance	Local governments responsible for basin maintenance	Natural infiltration of stormwater encouraged (swales)	Open space/recreation areas maximized	Wetlands protected	Site drainage onto adjoining property prohibited	Rearyard or frontyard drainage requirements	Grading plans reviewed for erosion potential of site	Erosion and sedimentation control permits issued by the local government
Addison Township	(✓)	(✓)	(✓)*	(✓)		(✓)	(✓)		(✓)			
Avon Township	✓	✓		✓		(✓)	(✓)	✓	✓		✓	
Bloomfield Township[1]	(✓)	(✓)							✓	(✓)	✓**	
Brandon Township	large developments			(✓)		(✓)	(✓)	(✓)	(✓)		✓	
Commerce Township	✓	✓	✓*	(✓)		(✓)	(✓)		✓		✓	
Groveland Township	(✓)	(✓)					(✓)	(✓)	(✓)		✓	
Highland Township	(✓)	(✓)	(✓)*	(✓)		(✓)	✓	(✓)	✓		(✓)	
Independence Township	(✓)	50-year (✓)			✓						(✓)	
Lyon Township	(✓)	(✓)	sometimes	(✓)		(✓)	(✓)		✓	✓	✓	
Milford Township	(✓)	(✓)				(✓)	(✓)		✓			
Oakland Township	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Orion Township	(✓)	(✓)	(✓)*			(✓)	(✓)	✓	(✓)	(✓)	(✓)	
Oxford Township	✓	✓	✓*	(✓)		(✓)	(✓)		(✓)		(✓)	
Pontiac Township	✓	✓		✓		(✓)	✓		(✓)		✓	
Rose Township	No policies due to rural character.											
Springfield Township	✓	✓	✓*	✓		(✓)	✓	✓	✓	✓	✓**	
Waterford Township	✓	50-year ✓			✓	(✓)	(✓)	(✓)	✓	✓	✓	
West Bloomfield Township	(✓)	(✓)	(✓)	(✓)		(✓)	✓	✓			(✓)	
White Lake Township	✓	✓	✓*	(✓)		✓	(✓)	(✓)	✓	✓	✓	

Key:
✓ - stated in adopted ordinance or regulation
(✓) - often required, but no ordinance or regulation

Notes:
* required when basin does not have outlet
** erosion requirements adopted

[1] policy of retention only for subdivision plats

TABLE 2

OAKLAND COUNTY CITIES
DEVELOPMENT REVIEW POLICIES WHICH BENEFIT STORMWATER QUALITY

	On-site retention with agricultural rate of discharge	Capacity for 10-year frequency storm	Capacity for 100-year frequency storm or more	Homeowner association responsible for basin maintenance	Local government responsible for basin maintenance	Natural infiltration of stormwater encouraged (swales)	Open space/recreation areas maximized	Wetlands protected	Site drainage onto adjoining property prohibited	Rearyard or frontyard drainage requirements	Grading plans reviewed for erosion potential of site	Erosion and sedimentation control permits issued by the local government
Bloomfield Hills	(✓)	(✓)				(✓)	(✓)					
Farmington	(✓)	(✓)							✓	(✓)		
Farmington Hills	✓	✓		✓			✓	(✓)	✓	✓		
Keego Harbor[1]	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.		(✓)	(✓)	n.a.	n.a.
Northville	sometimes			(✓)		(✓)	✓					
Novi	✓	✓	✓*	✓					✓	✓	✓	✓
Orchard Lake Village	(✓)	(✓)	(✓)*	(✓)			(✓)	✓	(✓)			
Pontiac	north end				(some)		(✓)	(✓)	(✓)			✓
Rochester									✓		✓	
South Lyon	sometimes						✓		✓	✓	✓	✓
Southfield	(✓)	(✓)					(✓)		✓	(✓)	(✓)	✓
Sylvan Lake[2]	(✓)	(✓)	(✓)*	(✓)				(✓)	(✓)		(✓)	
Troy	✓	✓	✓	✓	(some) ✓	(✓)	(✓)	(✓)	✓	✓	(✓)	✓
Walled Lake	(✓)	30 year (✓)		(✓)			(✓)	(✓)	(✓)	(✓)	(✓)	✓
Wixom	(✓)	✓	✓	(✓)		(✓)	(✓)	✓	(✓)	(✓)	(✓)	✓

Key:
✓ - stated in adopted ordinance or regulation
(✓) - often required, but no ordinance or regulation

Notes:
1 - completely developed
2 - all subdivision plat and site plan reviews by Oakland County Drain Commissioner
* - required when basin does not have an outlet

private retention basins is the responsibility of homeowner associations or private landowners.

Cities in southeast Oakland County which are part of the Twelve Towns Drainage System were not included in the stormwater program survey. Stormwater runoff from southeast Oakland County enters a combined sanitary and storm sewer system which connects to a pollution control retention basin. Major sewers and the pollution control retention basin are operated and maintained by the Oakland County Drain Commissioner. Cities in southeast Oakland County carry out public works programs such as street sweeping, road maintenance and road salting which affect stormwater runoff quality. Few cities, however, have stormwater control programs for managing the stormwater for flooding or water quality control.

Local government stormwater management activities can be classified into two categories: (1) programs and activities which are carried out for the purpose of controlling stormwater; and (2) programs and activities which are primarily carried out for purposes other than stormwater control but which have direct benefits for stormwater management. Both types of local government activities are described in this section.

Three types of stormwater management activities are described:

- Planning programs and activities: Activities directed toward the development of policies, plans, and regulations in order to solve or avoid stormwater runoff problems. Data collection, plan preparation, and governmental program reviews to identify impacts of stormwater runoff may be undertaken.

- Regulatory programs and activities: The administration of ordinances and requirements which control land uses and activities of the private sector. Regulatory programs often involve issuance of permits, approval of development plans, on-site inspections, enforcement, and adoption of regulations.

- Construction, operation, and maintenance programs and activities: Stormwter facilities such as retention/detention basins and storm drains must be properly operated and maintained to provide continuing flood control and water quality control benefits. In some cases, local governments may undertake the acquisition of land and construction of retention or detention basins to serve large areas. Inspection and maintenance services for on-site or areawide retention/detention basins may be an established program. Maintenance activities for retention and detention basins typically include "housekeeping" maintenance such as grass cutting and removal of trash, as well as cleaning of filters, structural repairs, and removal of sediment.

An overview of present government activities and policies related to stormwater planning, regulation, and operations and maintenance carried out by local agencies in Oakland County is presented in the sections which follow.

LOCAL GOVERNMENT STORMWATER PLANNING PROGRAMS

Stormwater management planning includes the organization of data related to stormwater flows and quality, the development of solutions to existing or potential future stormwater management problems, and the preparation and adoption of policies and plans to guide local government decision-making.

Many local governments in Oakland County which are involved with stormwater management activities carry out problem-solving activities when the need arises. Several local units of government, however, have or are developing stormwater plans which are designed to guide decision-making related to stormwater management. These local governments have recognized the value of having an organized data base for stormwater management decisions and the value of anticipating future problems and developing plans and strategies to avoid them.

Several stormwater management plans developed by local governments in the early 1970's map the locations of present and anticipated future storm drains. The City of Bloomfield Hills, the City of Troy, and Bloomfield Township have plans of this type. These plans consider natural drainage flows from various areas of the community (including areas outside the community's boundaries) and allocate flows to certain storm drains. Provisions for restricting stormwater flow, improving stormwater quality, or retaining stormwater on-site are not included in these plans.

More recently, local governments have undertaken planning activities which provide data for decision-making on stormwater retention and detention facilities. For example, the City of Farmington Hills is preparing a plan which will assign to various areas of the community certain allowable stormwater flows. On-site retention of stormwater rather than the design and construction of new storm drains will be the control measure emphasized. The potential for areawide (or regional) retention/detention facilities is being examined.

Waterford Township has completed an inventory of the present drainage system, including a delineation of drainage districts. It is the Township's policy that new developments should not violate the existing drainage pattern, and proposed development projects are compared with the stormwater and drainage system map prior to approval.

Master plans and comprehensive land use plans developed by local governments in Oakland County have not typically included stormwater management components. However, open space plan elements, environmental preservation elements, and wetlands and floodplains management elements included in Master Plans often have indirect benefits for stormwater management. For example, Pontiac Township's Master Plan includes policies and maps related to floodplain development. Floodplain management is viewed by the Township as being interrelated to stormwater management.

Oakland Township and West Bloomfield Township are two local governments which have identified planning for stormwater control as an important government responsibility. The scopes of their planning programs are described below.

Stormwater Management Planning in Oakland Township

Oakland Township's Storm Water Management Plan has recently been adopted as a component of a comprehensive planning program. Proper stormwater management is viewed as an essential aspect of the Township's future development, and the plan serves to articulate the policies and requirements related to development plan reviews. The plan includes the following components:

- Statement of Principle;
- Storm Water Management Policies;
- Planning Requirements;
- Design Requirements;
- Standard Details for Blue-Green Detention Areas;
- Design Criteria for Low Density Developments with Roadside Ditches; and
- Guidelines for the Preparation of the Comprehensive Drainage Analysis.

An official drainage, floodplain, and wetlands map; a map of soil types; and related technical information to assist engineers preparing development plans have also been prepared as part of the stormwater management planning program.

The Storm Water Management Plan includes a statement of principle which provides the rationale for many of the specific policies:

> "Oakland Township currently has an extensive system of natural drainage courses. These natural drainage courses are a valuable natural resource and a vital part of any drainage system. They have demonstrated their ability to safely carry the existing peak rates of runoff. It is, therefore, the intent of this plan to provide for the planning and design of all future developments such that the peak rate of stormwater runoff from an area following development shall not significantly exceed the peak rate of runoff that occurred prior to development. As a result, the need to increase the capacity of the natural drainage courses will be minimized, making it easier to preserve them in their natural state."

Major policies include the following:

- No modification to a major drainage course is permitted when the primary purpose is to increase the flow capacity;
- The 100-year flood plains of major drainage courses must be maintained in their natural state to the greatest extent possible;
- The maximum allowable discharge from a proposed development shall not exceed the existing peak rate from the area for a 100-year frequency storm;

- Sufficient space within developments should be allocated to attentuate the peak-developed flow rates; and
- Development concepts should be encouraged which will minimize the increase in the amount and rate of runoff generated.

Standards and design requirements contained in the plan are being used by Oakland Township as a substitute for adopted engineering design standards for stormwater management. Both water quality and water control for flooding purposes are important objectives of the plan. The plan is viewed as an extension of the Township's policies related to land use, open space protection, and wetlands protection.

Stormwater Management Planning in West Bloomfield Township

West Bloomfield Township has had a policy of requiring on-site retention of stormwater equivalent to site runoff for a 100-year storm frequency for many years. Recent activities of the planning department have included the development of a data base to assist developers and site planners in meeting the township's requirements. The development of a stormwater management policy plan is now in progress.

During 1975, a Master Plan Update Program was undertaken and an inventory of environmental resources was introduced. Small scale county-wide data provided by the Oakland County Planning Commission was enlarged on township base maps to indicate woodlands, topography, water generative areas (preliminary definition of wetlands and woodlands), soils data, and jurisdictional park and open space areas. Using the maps and both vertical and aerial photography, a composite overlay of all environmentally significant features was prepared.

In the past several years, maps showing topography, wetlands, and major and minor drainage basins have been delineated at a scale of 1" equals 200'. An overlay of property ownership boundaries has also been added to this base map data.

In the spring of 1980, the second phase of the Stormwater Management Planning Program was initiated. The second phase includes the development of drainage policy recommendations and methods of policy implementation. The intent of the Planning Program is to avoid problems which are expensive to correct after development has occurred and to provide solutions to existing drainage problems. The plan will be based upon the existing natural features of the area to the greatest extent possible, and will reflect the philosophy that stormwater runoff is a natural resource to be protected, utilized, and retained in the area to the greatest extent possible. Both water quality and water quantity control are important goals of the plan.

Assessment of Local Government Stormwater Management Planning Programs

Few local governments are presently conducting stormwater management planning programs, although problem-solving activities related to flooding and stormwater regulations are common. Several local governments have or are completing stormwater management plans which address both water quality and water quantity concerns and may be models for future planning programs in the region. The lack of funding for stormwater planning and the belief that the stormwater retention/detention regulations remove the necessity for stormwater planning may be contributing factors.

Major inter-jurisdictional planning efforts have not been initiated, perhaps because stormwater retention/detention policies are often followed and because major stormwater problems caused by upstream communities have not occurred. The growing recognition that areawide retention/detention facilities (serving several properties and areas) are effective may stimulate inter-governmental stormwater management planning.

LOCAL GOVERNMENT REGULATORY PROGRAMS FOR STORMWATER CONTROL

Out of the 35 local governments surveyed, 32 agencies review subdivision plats and/or site plans to assure proper stormwater management. In most cases, on-site retention or detention of stormwater runoff with discharge at an agricultural rate (0.2 cfs/acre) is the predominant policy. Many local governments also review plot plans for individual single-family homes to insure that drainage does not affect adjoining properties. Although stormwater regulations have been primarily developed for flood control purposes to prevent flooding on the site and downstream, certain policies and practices of local government serve to enhance stormwater quality as well. Engineering design standards, zoning and subdivision ordinances, erosion and sedimentation ordinances, and wetlands and flood plains ordinances may serve stormwater management purposes.

The summary of local government stormwater management regulations is organized into two sections: (1) types of ordinances and administrative approaches used for stormwater regulation; and (2) technical policies and standards administered by local agencies. Implications of present technical policies and standards for water quality management are highlighted in the second part.

Types of Ordinances and Administrative Approaches

The typical administrative process used for stormwater management regulations in Oakland County is to review stormwater aspects of development proposals when landowners submit plans. Stormwater is one of many aspects of the development which is reviewed (other aspects include siting, landscaping, grading, sanitary sewer, water supply, and wetlands and floodplain protection). Each local government reviews those aspects of development proposals which are considered important to that community. In some cases, review requirements are written into adopted ordinances or engineering design standards. In other cases, official standards have not been adopted but uniform policies and requirements are imposed.

Although stormwater management is often recognized by local officials as an important concern, the detailed site plan and subdivision plat proposals for stormwater management are considered a technical matter. The developer's engineer or designer frequently meets with local agency staff and consultants to identify site constraints and local government requirements. When the preliminary site plan or subdivision plat is submitted to the planning commission or the local governing body, staff and consultants identify changes which should be made to make the development compatible with the community's policies. Although some planning commissions take an active review role in aesthetic and maintenance questions related to retention and detention facilities, many aspects of stormwater management remain the responsibility of staff and consultants.

Stormwater management regulations are incorporated in the following types of ordinances and standards:

- Engineering design standards;
- Erosion and sedimentation control ordinances;
- Zoning and subdivision control ordinances; and/or
- Wetlands and floodplains protection ordinances.

Waterford Township has followed a unique approach of incorporating detailed engineering design standards for retention and detention facilities into its site plan review ordinance. The content of the standards, however, closely resembles engineering design standards in form.

Engineering design standards typically include specific requirements and engineering specifications for the construction of facilities. Engineering design standards are often organized in a booklet which includes standards for grading, storm sewer design and construction, retention and detention facilities, sanitary sewers, and water mains. In some cases, engineering design standards are officially adopted by the local agency or included in an ordinance. In other cases, the design standards are used by local government staff and consultants as a guide when development plan reviews are completed. Nearly all of the local governments surveyed in Oakland County utilize engineering design standards. Engineering standards related to retention and detention facilities have been officially adopted in 11 local units of government, while 17 local units of government use standards as a guide. Engineering design standards are usually applied to subdivision plats and site plans but not to single-family home developments.

Local governments which require on-site retention and detention of stormwater but do not have adopted engineering design standards or regulations often note that they "do not need to have stormwater retention/detention regulations because there are already too many ordinances." It is suspected that an additional reason is the concern that adoption of specific standards will not allow for consideration of unique circumstances related to particular development plans.

Springfield Township has officially adopted engineering design standards pertaining to on-site retention/detention of stormwater. A specific provision allowing for hardship variances is included in the "Grading and Surface Drainage Design Standards." The Township Board may allow a variance if all of the following conditions are met:

1. Due to special circumstances, grading and/or drainage requirements would deprive the landowner reasonable use of the property.

2. A variance is necessary for the preservation and enjoyment of a substantial property right.

3. The proposed variance is not detrimental to public welfare or injurious to other property.

4. The variance will further the written objectives and policies of the Township.

By adopting engineering design standards, the Township has an enforceable basis for development review decisions. The variance procedure allows for waivers of requirements in appropriate circumstances.

Thirteen cities and villages in Oakland County have elected to administer the soil erosion and sedimentation control permit program in conformance with requirements of the Michigan Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972). Soil erosion and sedimentation permits issued by local governments serve to restrict the transport of sediment from the site. The management of stormwater is usually necessary to control sediment. Although charter townships in Oakland County may also adopt their own erosion ordinance, none have chosen to do so. Instead, the Oakland County Drain Commissioner administers erosion and sedimentation control permit requirements in all townships.

Although erosion control permits are not issued, approximately half of the townships surveyed (including charter and general law townships) do review grading plans submitted with development proposapls in order to reduce the potential for erosion. In some cases, such as Bloomfield Township, specific standards for the grading plan review are included in the engineering design and standards ordinance. This local erosion review supplements erosion and sedimentation control permits issued by the Oakland County Drain Commissioner.

Zoning and subdivision control ordinances rarely contain substantive requirements related to stormwater management. From a procedural standpoint, however, zoning and subdivision control ordnances can be very important. Zoning and subdivision control ordinances typically describe development plan submittal and review procedures. In some cases, the requirement that the agency's engineer will complete a stormwater review, or that "adequate drainage" be provided, is specified.

Zoning and subdivision control ordinances also include important requirements related to fees, inspections, and enforcement. Substantive provisions in zoning and subdivision regulations which affect stormwater management include landscaping and open space requirements, cluster development and planned unit development options, and wetlands or floodplain preservation zones. Such provisions, however, are rarely adopted for stormwater management purposes.

Seven local governments in Oakland County have adopted ordinances which are intended to protect wetlands and flood plains as natural areas. These ordinances require special permits for alteration of wetlands and/or floodplains within the local jurisdiction. In the statement of purpose, several local ordinances note the importance of wetlands as stormwater retention and detention areas.

Special-purpose ordinances specifically for stormwater management purposes have not been adopted by Oakland County local governments to date. As policies for stormwater management continue to develop and extend beyond engineering design concerns, it is expected that special stormwater management ordinances will be found useful.

Technical Policies and Standards

Technical policies and standards of local governments in Oakland County which affect stormwater management have been organized into the following categories:

- Detention and retention of stormwater on the site;
- Natural infiltration of stormwater;
- Use of wetlands and undeveloped floodplains to hold stormwater runoff;
- Open space preservation policies;
- Erosion control policies;
- Site drainage requirements; and
- Storm sewer design requirements related to water quality.

Each of these topics is discussed below. Maintenance provisions and requirements are described in the operations and maintenance programs section of this report.

Detention and Retention of Stormwater On-Site

Out of the thirty-five local units of government surveyed, thirty follow a policy of requiring on-site retention or detention of stormwater when major developments are proposed. In nearly all cases, the policy applies throughout the local government jurisdiction and applies to site plans and subdivision plats. In most cases, however, retention and detention requirements depend upon the capacity of the receiving stream at the outlet. In such cases, discharge of runoff is permitted if the receiving stream is of substantial size.

If detention or retention of stormwater on the site is required, discharge is always limited to the predevelopment (or agricultural) rate of discharge. The standard used by the Oakland County Drain Commissioner of 0.2 cfs/acre for predevelopment or agricultural runoff rates is utilized by local governments throughout Oakland County. This standard allows stormwater runoff to flow off the site at a controlled rate.

Written standards which define the size of an adequate outlet and receiving stream have not been drafted or adopted by any Oakland County community. Following the recommendations of the Oakland County Drain Commissioner, however, adequate receiving streams are generally only major rivers, lakes, and recent county drains. Because Oakland County is at the headwaters of the Rouge, Huron and Clinton River basins, many streams are small and retention/detention of stormwater is often necessary. The cumulative effect of unrestricted stormwater discharges from multiple development sites within a sub-watershed is not usually considered by local governments. Of special note, however, is the fact that several local governments including Farmington Hills, Troy, and Oakland Township, require retention or detention regardless of the size of the receiving stream.

The design of structures used to store stormwater varies throughout Oakland County. Typically, local government engineering design standards encourage the use of detention or retention basins. Several local governments prefer dry detention basins in order to minimize problems related to maintenance and safety. Most local agencies will allow the installation of either detention or retention basins, provided that the basins are properly designed and suitable for the site.

Some retention/detention basins constructed in Oakland County in the early 1970's have been characterized as "fenced pits." Local governments discourage this approach to stormwater storage except in commercial or industrial areas where the detention facility will not be visible. Local governments in Oakland County pay particular attention to aesthetic aspects of retention and detention basins, and encourage the integration of the basin into the landscaping plan for the development. Many basins have become landscape features which are amenities, adding to the property values in the development.

All communities which require on-site retention or detention of stormwater require a storage capacity for a 10-year frequency storm or greater. Fifteen of the local governments surveyed require at least a 100-year storm frequency storage capacity if retention basins without outlets are constructed. Of these communities, two local governments (Oakland Township and the City of Troy) require a 100-year storm frequency storage capacity or more in all cases. The Oakland County Drain Commissioner requires storage for two consecutive 100-year storms if a retention basin is constructed.

In calculating the volume of runoff to be stored, several local governments require drainage from areas off the site to be included. Oakland Township, however, is the only local government which allows a decrease in the required basin storage volume when natural infiltration (through swales or blue-green areas) is planned. In effect, the Oakland Township method of calculation provides storage for a 100-year frequency storm but allows stormwater storage to be distributed to natural areas and man-made basins. A simple method for runoff calculation developed by the Oakland County Drain Commissioner is used by many local governments and consulting engineers in Oakland County.

A second frequently-used method for stormwater detention is parking lot storage. Many local governments and consultants recommend parking lot storage when commercial and industrial sites smaller than 1/2 acre are involved. Small ponds or detention basins and swales, however, are sometimes used on small sites. Several local government engineering design standards allow for rooftop stormwater storage, although this method has rarely been used in Oakland County.

Local governments have implemented on-site retention and detention requirements for stormwater quantity control. Concerns include flooding on the site, flooding downstream, and possible court cases from downstream communities. The fact that retention and detention is extensively required, however, has major implications for stormwater quality control. When the flow of stormwater off the site is slowed, sediments and associated plant nutrients and toxic materials can settle out. Present local government policies for on-site retention and detention have important stormwater quality benefits.

The stormwater quality benefits of each retention or detention basin, of course, varies with the design and location of the basin. Factors which influence the performance of basins for water control include the following:[1]

- Volume available for temporary storage of stormwater -- the greater the volume, the better the performance;
- The presence of a restricting outlet control device such as a perforated metal riser;
- Reduction in emptying time between runoff events;
- Increased fraction of larger soil particles;
- Minimizing short circuiting -- i.e., the direct flow of stormwater from the inlet to the outlet;
- Large surface area for a given storage volume;
- Introduction of a coagulant, such as alum, and coagulant aids; and
- An outlet control configuration that minimizes velocity in the detention/retention facility in the vicinity of the outlet.

Engineering designs which maximize the water quality benefits of detention and retention basins (without affecting stormwater storage functions) are presently being tested by the Southeast Michigan Council of Governments (SEMCOG). Test basins are located in the City of Troy.

Natural Infiltration of Stormwater

With the exception of Oakland Township, local governments in Oakland County have not incorporated policies encouraging natural infiltration of stormwater into stormwater plans or regulations. Nevertheless, four cities and at least fifteen townships administer policies which result in some natural infiltration of stormwater on the site. The typical policy is to encourage the preservation of grassed or wooded areas for recreation and amenity purposes. Cluster development options in zoning and subdivision ordinances are typical administrative approaches. In addition, a number of Oakland County local governments try to retain natural hills, valleys, and swales on the site. Some officials and engineers interviewed for this study indicated the value of retaining natural swales for stormwater infiltration, although written policies directed specifically toward natural infiltration have not been adopted.

Oakland Township encourages the use of natural swales and depressions on the site for stormwater detention. The Township's Storm Water Management Plan describes the the "blue-green" development concept, where "blue-green" swales alternate in a chain with grassed areas to provide stormwater detention. "Blue-green" areas are either "blue," with permanent standing water, or "green" with no standing water. "Blue" areas must be designated for retention basins. "Blue-green" areas have particularly high water quality benefits, since the detention time is extended and a series of settling basins, in effect, are provided. In Oakland Township, "blue-green" areas are viewed as a supplement to larger retention and detention facilities; although the required basin capacity may be reduced to reflect the storage capacity provided by the "blue-green" areas.

Local governments which encourage the use of natural areas for stormwater retention sometimes prohibit grading or the removal of vegetation which would alter rolling topography, swales, and depressions. When considering the use of swales and depressions for stormwater retention, however, local agencies and consultants try to avoid problems with standing water, muddy depressions, and weeds. Although policies are not typically written into plans or regulations, many communities encourage the use of grassed swales to direct stormwater flows to appropriate locations.

Policies related to natural infiltration are often the result of soil conditions. Communities with clay soils do not encourage natural infiltration since standing water in small pools and runoff from the property could result. The rolling hills and woodlands of northern and western Oakland County, however, provide excellent land for natural infiltration.

Seepage pits or leach basins are small holes or dry wells dug in the ground for purposes of stormwater detention. Because of their small size, seepage pits are usually not considered as an alternative for retention or detention basins, although they may be useful for handling small amounts of stormwater. Maintenance of seepage pits or leach basins when sediment enters the basin is another concern. Oxford Township has a policy of encouraging seepage pits. Sandy soils in Oxford Township provide excellent areas for seepage pits and other natural infiltration techniques.

Use of Wetlands and Undeveloped Floodplains to Hold Stormwater

Wetlands and floodplain preservation policies and ordinances help to insure that these natural areas are available to receive and hold stormwater runoff. Approximately sixteen of the local governments surveyed follow a wetlands protection policy. Seven communities have adopted wetlands protection regulations, usually in the form of a wetlands, floodplains, and watercourse protection ordinance. Many of the adopted ordinances state the importance of wetlands protection for water quality purposes.

West Bloomfield Township is an example of a township with an adopted wetlands protection ordinance which is consciously using wetlands for stormwater detention and control purposes. It is recognized in West Bloomfield and other communities, however, that heavy concentrations of urban runoff containing pollutants can harm wildlife and fish which use wetland areas for habitat. The discharge of stormwater into wetland areas after some settling of sediments has taken place, however, is often a useful stormwater management method. Most wetlands ordinances prohibit the direct discharge of stormwater from storm drains into wetlands without a permit. Whereas the Michigan Wetlands Protection Act regulates activities in wetlands contiguous to water bodies and wetlands greater than five acres in size, local ordinances typically require permits for all wetland areas.

Many local governments in Oakland County have adopted floodplain regulations which meet requirements of the National Flood Insurance Program. Although not required by the National Flood Insurance Program, policies and regulations for keeping floodplains as open space areas have been developed. The City of Southfield, for example, prohibits development in the floodplain adjacent to the Rouge River.

Wetlands and floodplain protection policies have direct benefits for stormwater quality. During heavy rainstorms, wetlands and floodplains serve a detention and retention function by slowing and holding stormwater runoff. Wetlands are particularly beneficial for stormwater quality because grasses in the wetland catch and hold sediments.

The use of wetlands for stormwater quality purposes, however, is a policy which must be applied with care. Pollutants and sediment may damage the natural features of major wetlands. Technical guidelines for effectively using wetlands without damage will be needed in the future.

Open Space Preservation Policies

Local governments in Oakland County use several different methods to encourage open space preservation, including the following:

- Cluster development in subdivisions;
- Large-lot zoning; and
- Landscaping requirements for small developments.

Nearly all of the townships and approximately half of the cities surveyed encourage open space preservation in some manner.

Cluster development options included in zoning and subdivision ordinances include planned unit developments, planned residential development, and cluster development. Although the specifications of individual Zoning Ordinances differ, the intent is the same. These types of zoning options allow the developer to cluster buildings on one area of the site (sometimes with a small increase in overall site density allowed) while maintaining a community open space area on the remaining portion of the site. Cluster development reduces the length of roads and utilities in the development, thereby saving costs. Since the amount of impervious surfaces is reduced, direct stormwater quality benefits result. The open space areas may serve as natural infiltration areas for stormwater.

Stormwater retention or detention basins are sometimes integrated into the open space and recreation areas of the development. Some local governments, however, do not count stormwater facilities when calculating required open space lands for the developments.

The inclusion of planned unit development options (and other cluster development options) in township zoning ordinances has been controversial in some cases. Rural area residents sometimes believe that cluster options will change the rural character of the community or have other undesirable effects. In some townships, a cluster development option has been included in the zoning ordinance but has not been used.[2] Public education and information efforts are often needed prior to the adoption of cluster development options.

Many rural townships encourage large-lot zoning in order to protect the natural features and attractiveness of the area. Large-lot zoning is not promoted through adopted standards or ordinances, but small, scattered private road developments with one acre lots are not unusual in rural Oakland County. When one acre lots are developed in such a way that much of the site is undisturbed, water quality benefits result. The natural areas on the site serve to slow floodwaters and allow natural infiltration to occur.

Landscaping requirements for site plans are usually adopted for aesthetic purposes. Since landscaping results in vegetated areas, landscaping provides stormwater quality benefits. Ways in which a landscaping requirement can be used to also provide stormwater control benefits need to be identified, however, to maximize benefits. Many local government zoning ordinances have landscaping requirements for large industrial, commercial, and multi-family residential developments.

Erosion Control Policies

Soil erosion and sedimentation control, especially during construction, is extremely important for stormwater quality protection. Soil particles pick up metals and other pollutants which can threaten natural habitats and public health. Sediment itself chokes natural waterways and affects biological and chemical cycles.

Local governments in Oakland County control soil erosion in two ways:

1. Through the review of site grading plans, local agencies can identify development on steep slopes which should not occur and can minimize the area of soils exposed; and

2. Cities, villages, and charter townships may elect to issue erosion and sedimentation control permits and enforce other requirements of the Michigan Erosion and Sedimentation Control Act (Act 347, P.A. of 1972).

Nearly all local agencies surveyed require the submittal of topographic information or a grading plan as part of the development plan. The grading plan identifies site elevations and can be used to determine drainage flows. Twenty-five of the local governments surveyed review the grading plan for erosion control as well as drainage control purposes.[3]

The Oakland County Drain Commissioner administers the soil erosion and sedimentation control permit program for many local jurisdictions in Oakland County. Some local governments view the permits issued by the County as the mechanism for controlling erosion. The local governments which review grading plans for erosion control purposes, however, recognize that erosion permits are typically issued after basic site plan decisions have been made. The placement of structures on the site, grading of steep slopes, and the amount of area exposed during construction can affect soil erosion. The grading plan review serves to reduce overall erosion potential from the site. Erosion control permits, then, address specific measures such as straw bales, filters, and sedimentation basins which will control erosion and sedimentation during construction.

Several Oakland County governments have included specific erosion control requirements in engineering design standards. For example, Bloomfield Township has adopted the following provisions:

- The smallest practical area of land should be exposed at one time during development, and the exposure should be kept to the shortest practical time period;
- Temporary vegetation, mulching, and sediment basins should be used;
- Provisions should be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development;
- Permanent final vegetation and structures should be installed as soon as practical in the development;
- The development plan should be fitted to the topography and soil so as to create the least erosion potential; and
- Wherever feasible, natural vegatation should be retained and protected.

Springfield Township has included similar provisions in the grading and site drainage section of its subdivision ordinance. These guidelines address site planning concerns and erosion control measures placed on the site during construction. The standards are compatible with permit requirements under the Michigan Erosion and Sedimentation Control Act and supplement erosion and sedimentation control permit regulations.

Several cities surveyed have elected to directly administer the erosion and sedimentation control permit requirements. The Cities of Novi, Pontiac, Southfield, Walled Lake, and Wixom have adopted erosion and sedimentation control ordinances to meet state requirements. Site plan concerns and erosion control measures are addressed when permit applications are made. Developments which are one acre or more in size or which are located within 500 feet of a lake or stream are subject to permit requirements. Erosion control permit reviews typically are conducted at the same time that other local government development plan reviews are completed.

Cities and townships which do not issue erosion and sedimentation control permits sometimes provide assistance to the Oakland County Drain Commissioner's erosion control permit program. The Oakland County Drain Commissioner has only two persons assigned to field inspections and enforcement for the entire County. Local officials and building inspectors in some communities monitor development activities and notify the Oakland County Drain Commissioner when violations are spotted. Most local governments are cautious about undertaking inspection or enforcement activities which are the responsibility of Oakland County, but recognize that some support can be given without assuming enforcement responsibilities.

Site Drainage Requirements

Site drainage requirements may apply in two situations: (1) a plot plan for a single home or building apart from a subdivision; or (2) a plot plan for a structure contained within a subdivision. Site drainage requirements may be contained in the zoning ordinance or engineering design standards for stormwater control.

Reflecting an important common law principle, approximately thirty local governments surveyed in Oakland County prohibit site drainage onto adjoining property which exceeds predevelopment drainage rates. In many cases, such requirements have been developed as a result of citizen complaints about localized flooding. When reviewing plot plans, most building inspectors direct attention to the route and quantity of stormwater runoff -- not to on-site retention or detention.

Some communities have adopted specific requirements for rear yard or front yard site drainage. Such requirements are particularly applicable to subdivision development where drainage patterns are created by overall grading of the site. Sometimes, for example, side yard or back yard swales are required to detain stormwater and direct it to a retention or detention facility. The adoption of rear yard or front yard site drainage requirements is more prevalent in areas with clay soils or flat topography.

The relationship of site drainage requirements to stormwater quality varies among local jurisdictions. In most cases, however, the site drainage reviews serve the purpose of reducing runoff from the site and directing it to appropriate storage areas. These approaches, in turn, lead to increased natural infiltration, stormwater detention or retention, and improved water quality.

Storm Sewer Design Requirements Related to Water Quality

Many local governments in Oakland County (especially townships in developing or rural areas) do not have engineering design requirements for the construction of large storm sewers which transport stormwater from subdivisions to lakes, rivers, or streams. However, many local governments have engineering design standards for storm sewers which collect stormwater from individual lots and transport it to detention or retention facilities.

Few local governments have storm sewer design criteria which are intended to improve stormwater quality. An exception is the City of Southfield, which requires installation of cast iron elbows in catch basins which connect to storm sewers. The City of Southfield periodically cleans the catch basins as part of regular highway maintenance activities.

Assessment of Local Government Stormwater Regulatory Programs

All but seven local governments surveyed in Oakland County frequently require the on-site retention or detention of stormwater when development proposals are reviewed. The most common approach to retention and detention is the construction of storage basins which hold stormwater and then discharge it at an agricultural (or predevelopment) rate. Many local governments encourage natural infiltration of stormwater when soils allow, although infiltration is rarely considered when basin volume calculations are made. Open space, wetlands, and floodplain preservation policies help reduce stormwater runoff, although preservation policies are rarely directed to stormwater management concerns.

The policies of the Oakland County Drain Commissioner concerning on-site retention and detention of stormwater in subdivision plats and requirements for connection to county drains have had a significant influence on local government policies. Many local governments utilize the Drain Commissioner's policies in their own reviews, applying the standards to both site plans and subdivision plats.

Some local governments have gone beyond the regulations of the Drain Commissioner, however, by encouraging site planning which uses natural areas and wetlands for stormwater infiltration into the soils. Although this approach is used, it is rarely reflected in adopted plans and regulations. It is expected that present operating policies and practices will be incorporated in adopted stormwater policies and regulations as benefits from these approaches are recognized.

From a regulatory standpoint, an institutional framework for stormwater quality management on a county-wide basis does exist. The framework consists of two tiers of agencies: the Drain Commissioner with responsibilities and a program for stormwater reviews of subdivision plats throughout the County, and local governments with programs for the review of subdivision plats and site plans. Although several local governments do not carry on active stormwater review activities, most local governments are concerned about both the storage and conveyance of stormwater. The institutional framework has been developed primarily for purposes of stormwater quantity control but can be used to implement stormwater quality control measures.

State requirements for erosion and sedimentation control permits strengthen the county-wide institutional system by insuring that all large-scale developments employ erosion control techniques during construction. All proposed permanent soil erosion control measures are subject to the permit program. The Oakland County Drain Commissioner administers and enforces the requirements in many local jurisdictions. Several cities have chosen to administer their own programs.

The enforcement of county and local government regulations through frequent on-site inspections and monitoring of construction activities is probably the weakest aspect of stormwater regulatory programs. A comprehensive review of enforcement problems was not conducted for this study. However, several local governmental officials noted that the Oakland County Drain Commissioner's Office does not have adequate personnel to complete frequent inspections of sites subject to erosion and sedimentation control permit requirements. Similarly, it is believed that building inspectors in some local jurisdictions are unable to complete all of the field inspections necessary to assure that development plans are constructed as they are approved. Some local governments in Oakland County have solved the inspection/enforcement problem by charging developers for the cost of completing inspections. This policy puts an added burden on developers to complete developments in accordance with approved plans, thereby keeping inspection times to a minimum.

Although many of the present policies and regulations of local governments benefit stormwater quality, water quality has rarely been considered a reason for adopting stormwater regulations. In several townships, however, the benefits of certain stormwater management policies for groundwater protection and inland lakes protection have been recognized. In townships such as West Bloomfield, Oakland, and Commerce, the dual benefits of water quantity and water quality control are recognized. Because of the importance of natural resources to the economic development of Oakland County, it is expected that stormwater management for both water quantity and water quality control purposes will become more prevalent in the future.

LOCAL GOVERNMENT FACILITY MAINTENANCE PROGRAMS

A number of cities have undertaken storm drain construction projects. In addition, cities and townships have petitioned the Oakland County Drain Commissioner to construct large storm drains within their jurisdictions. Only the City of Troy has constructed an areawide retention/detention facility, although the usefulness of the areawide approach is being investigated by several communities. Regardless of construction activities, many local governments in Oakland County have concerns about facility maintenance and, in some cases, conduct their own maintenance programs. Maintenance is essential for continued facility functioning. Storm drain and retention/detention facility maintenance activities and programs of local governments in Oakland County are highlighted below.

Storm Drain Maintenance Activities

Many cities but few townships in Oakland County own and maintain their own systems of storm drains. Municipal storm drains are often small enclosed pipes which connect to large pipes or open channel drains owned and maintained by the Oakland County Drain Commissioner. Townships often do not have the equipment or staff required for storm drain maintenance operations.

Several cities and townships, (Avon Township and Bloomfield Township are examples) carry out emergency repairs to remove obstructions on storm drains within their jurisdiction. Many local governments are faced with the problem that they do not have clear ownership or maintenance responsibilities for storm drains within their jurisdiction. If a drain is not owned by the Oakland County Drain Commissioner or the Oakland County Road Commission, responsibilities are often unclear.

Retention/Detention Basin Maintenance Activities

Two types of maintenance for retention/detention facilities are important:

1. Removal of sediment and repair of structures, as needed.
2. "Housekeeping" maintenance, including the cutting of grass and removal of trash.

When basins are constructed in subdivisions, they are typically located on land which is owned by a homeowner association. To assure maintenance of retention and detention basins in subdivisions, approximately nineteen of the local governments surveyed require maintenance by homeowner associations. Before final approval of the subdivision is granted by the local government, an agreement is signed with the developer which specifies that a homeowner association will be formed to carry out maintenance of common open space areas (including retention/detention basins) and that all maintenance activities will be financed by residents. Financial responsibilities to support the homeowner association are then included in the restrictive deed covenants for each lot. In some cases, development agreements state that the local government shall have the right to carry out maintenance activities and charge homeowners if the homeowner association fails to properly carry out its responsibilities.

Most retention and detention basins constructed to date in Oakland County are relatively new and have not required the removal of sediment. Maintenance activities typically carried out include removal of trash and cutting of grass. Most development maintenance agreements do not specify types of maintenance activities which must be conducted.

Engineers in the City of Troy, City of Southfield, and other communities which have retention and detention basins which are ten years old note that many basins require removal of sediment after a period of time. If small amounts of sediment are not periodically removed, large equipment and a public works project may be necessary. Removal of sediment from a large retention basin may cost $10,000 or more. The administration of major maintenance activities has not been faced to date by homeowner associations.

The Cities of Troy and Pontiac, and Townships of Independence and Waterford have municipal public works programs which include basin maintenance for certain facilities. Oakland Township has established the policy that the Township will maintain stormwater facilities, but presently has few facilities to maintain. These communities have taken a more direct role in maintenance in order to assure proper care for facilities. Communities with public works programs note that homeowner associations sometimes have difficulty carrying out maintenance activities in a way which meets the standards of the community.

When retention/detention facility maintenance is part of a larger public works program, community costs are significantly reduced. Independence Township finances maintenance activities through assessments to benefiting property owners. The City of Troy and Waterford Township require the establishment of a maintenance fund by the developer, and then use interest on the fund to finance maintenance activities.

In nearly all Oakland County local governments, maintenance of retention and detention basins on developments such as commercial and industrial parcels which are not within a subdivision are the responsibility of the property owner. Agreements to assure proper maintenance by the property owner are not typically signed. Organized basin inspection programs covering basins in subdivisions and smaller developments have not been organized.

Assessment of Local Government Facility Maintenance Programs

The institutional framework which provides for the review and approval of stormwater facilities when new developments are proposed does not extend to the maintenance of facilities. Although retention and detention basin maintenance responsibilities are often assigned to subdivision homeowner associations, inspections to assure proper maintenance are usually not provided by the local government. Basins on individual parcels are typically the maintenance responsibility of the property owner.

Some local governments have deliberately avoided assuming responsibilities for retention/detention basin maintenance because of concerns for liability. If a child, for example, is injured while playing near a retention basin and the local government is responsible for maintenance of the basin, a costly court suit could result. The use of liability insurance is one approach to this problem.

If retention and detention basins are to continue useful functioning for stormwater quality and quantity control, adequate maintenance is essential. When retention/detention basins effectively trap sediment, periodic removal of sediment is particularly important. Present gaps in the institutional system for retention/detention facility maintenance include the following:

- When maintenance responsibilities are assigned to homeowner associations, maintenance which is needed to assure proper functioning of stormwater facilities is not described. Although homeowner associations will normally attend to "visible" maintenance tasks which affect the attractiveness of the area, periodic sediment removal or other less visible activities may be neglected. Homeowner associations may not have the expertise to recognize maintenance needs.

- In many cases, local governments do not enter into written agreements to assure proper maintenance on sites which are not subdivisions.

- Regular inspections of retention/detention basins in subdivisions and site developments are rarely conducted.

Since many retention and detention basins in Oakland County are new, experience with maintenance problems is limited. The lack of assurance of proper maintenance in some cases, however, may lead to future problems.

FOOTNOTES: CHAPTER IV

[1] Walesh, Stuart G., "Detention/Retention Facilities: Preliminary Engineering," p. 25. Workbook materials presented as part of the course "Urban Storm and Flood Water Management," ASCE Continuing Education Program in cooperation with the Lansing-Jackson Branch of the Michigan Section - ASCE and the Water Management Division of the Michigan DNR; Michigan State University, East Lansing, Michigan, September 15-16, 1980.

[2] Local governments which have adopted zoning ordinance provisions allowing for cluster development are noted in Tables 1 and 2 under the policy "open space/recreation areas maximized." A ✓ indicates adoption of a zoning ordinance provision allowing cluster development. A (✓) indicates local government encouragement of open space preservation through cluster development and other means.

[3] Local governments which require the submittal of a grading plan (or equivalent topographic information) are noted on Tables 1 and 2 under the policy "grading plans reviewed for erosion potential of the site." A ✓ indicates that specific erosion control policies have been included in zoning regulations, subdivision regulations, or other ordinances. A (✓) indicates that the local government typically reviews grading plans for erosion control purposes, even though specific standards have not been adopted.

APPENDIX A

APPENDIX A

OAKLAND COUNTY TOWNSHIPS*

STORMWATER MANAGEMENT PROGRAM SUMMARIES

- Addison Township
- Avon Township
- Bloomfield Township
- Brandon Township
- Commerce Township
- Groveland Township
- Highland Township
- Holly Township
- Independence Township
- Lyon Township
- Milford Township
- Oakland Township
- Orion Township
- Oxford Township
- Pontiac Township
- Rose Township
- Springfield Township
- Waterford Township
- West Bloomfield Township
- White Lake Township

*Note: Novi Township, Royal Oak Township, and Southfield Township have not been included because of their small size and because they are substantially developed.

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ADDISON TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Addison Township has not adopted plans related to drainage and stormwater management.

Regulatory Programs

Site plans and subdivision plats are reviewed by the Township and consultants to insure that the public health, safety and welfare are protected. A review of stormwater runoff and drainage aspects of each development proposal is completed. Consulting engineers generally follow the standards of the Oakland County Drain Commissioner in reviewing subdivision plats and site plans. Addison Township has not formally adopted engineering design standards for stormwater management.

Typically, retention or detention basins are required for new development. Reflecting the standards of the Oakland County Drain Commissioner, basins must be designed to hold volume equivalent to runoff from a 10-year frequency storm, with discharge to the receiving stream at an agricultural rate (0.2 cfs/acre). Addison Township encourages the construction of dry basins which dewater after a storm in order to reduce maintenance problems and safety concerns. If retention basins without outlets were constructed, the operating standard of the Drain Commissioner (storage volume for two 100-year frequency storms back-to-back) would be followed. To date, very few retention or detention basins have been necessary since the township is rural with few development proposals.

Natural infiltration of stormwater through the use of natural depressions and swales is sometimes encouraged. Most development is large-lot single-family home development on private roads. Because of the rolling topography of the Township, natural infiltration occurs without special site preparation. A cluster development option is included in the Zoning Ordinance, and the Township generally encourages open space preservation. A specific policy on wetlands protection has not been adopted.

When development proposals are submitted, a grading plan is required. Erosion and sedimentation control permits are issued by the Oakland County Drain Commissioner.

Operation and Maintenance Programs

Addison Township does not own or maintain storm drains or retention/detention

facilities. Private land owners are responsible for the maintenance of basins which have been constructed to date.

For Further Information:

Ms. Mary Ann Thompson
Addison Township Clerk
3 E. Elmwood
Leonard, MI 40038
(313) 628-3317

Mr. David Redash
Spalding, Dedecker & Assoc., Incorporated
655 W. 13 Mile Road
Madison Heights, MI 48071
(313) 585-5545

AVON TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Avon Township expects to initiate a stormwater management planning program in 1981. The planning program will include a review and update of current engineering standards related to stormwater and retention. Approaches to remedy stormwater flooding problems in the southern area of the Township may also be identifed.

Regulatory Programs

Over the past years, a number of ordinances and regulations which are related to stormwater and drainage have been adopted.

Since 1976, Avon Township has applied uniform criteria and policies related to stormwater management when site plans and subdivision plats are reviewed. All development proposals which are larger than one residential unit are reviewed for drainage purposes, and on-site retention (at least to the 10-year storm capacity) is required. Stormwater discharge at a rate above the pre-development rate is not allowed unless storm drains to receive the outflow are available.

Natural infiltration, retention or detention basins, and/or parking lot detention may be used to meet the Township's policies. The use of depressions and swales to hold stormwater (until natural infiltration can occur) is definitely encouraged. When private roads (lot splits) are constructed, uncovered roadside ditches are encouraged. Whenever possible, natural drainage courses are used and maintained in the site plan.

When basins are constructed, basins with standing water are encouraged since the basins can become assets and amenities in the community. Dry detention basins are also permitted, provided that a suitable slope at the bottom of the basin is provided to eliminate water. The Township Landfill Ordinance provides specific requirements for slopes and fencing. Standards of the Oakland County Drain Commissioner are also followed.

When development plans are submitted, grading plans are reviewed to insure proper drainage and to minimize the area of exposed soils. The Township assists the County erosion and sedimentation control program by watching for violations on construction sites.

The Floodplain, Watercourse and Wetland Protection Ordinance adopted by Avon Township has several stated purposes which are related to water quality:

1. To provide for the protection, preservation, proper maintenance and use of township watercourses and wetlands in order to minimize disturbance to them and to prevent damage from erosion, turbidity or siltation, a loss of fish or other beneficial aquatic organisms, a loss of wildlife and vegetation, and/or the destruction of the natural habitat thereof.

2. To provide for the protection of the Township's potable freshwater supplies from the dangers of drought, overdraft, pollution, or mismanagement.

3. To secure safety from floods; to reduce the financial burdens imposed upon the community through rescue and relief efforts occasioned by the occupancy or use of areas subject to periodic flooding; to prevent loss of life, property damage and other losses and risks associated with flood conditions; and to preserve the location, character and extent of natural drainage courses.

Proposals to dredge or fill any floodplain, watercourse, or wetland area designated on the official maps requires a permit. Prohibited activities include the following:

- Dredge or fill activities in any wetland area or within 150 feet of the edge of any wetland;

- Construct or extend a temporary, seasonal, or permanent operation or structure upon bottomlands or wetlands;

- Construct or extend any conduit, pipe, culvert, or open or closed drainage facility erected for the purpose of carrying stormwater runoff from any residential site of two or more single-family or multiple residences, commercial sites, parking areas, paved or unpaved private or public roads, or any other land use permitting discharge of silt, sediment, organic or inorganic materials, chemicals, fertilizers, flammable liquids, or any substance producing turbidity, except through an interceptor, retention or settling basin, filter or treatment facility designed to control and eliminate the pollutant before discharge to wetland.

The improvement of stormwater quality is a byproduct of this ordinance.

Operation and Maintenance Programs

Although Avon Township does not own storm drains or have legal responsibility for storm drain maintenance, the Township occasionally provides maintenance on drains in emergency situations.

When retention or detention basins are constructed, maintenance becomes the responsibility of the property owner or the homeowner association. If a homeowner association does not perform proper maintenance, the Township has the legal right to complete the maintenance and assess property owners for the cost. Maintenance provisions are recorded in the official deed records for subdivision plats.

Avon Township's Weed Cutting Ordinance helps assure proper weed control in subdivisions. Each year, owners in subdivisions are notified that weeds need cutting (including weeds in retention/detention basins).

For Further Information:

Mr. C. Neall Schroeder, Engineer
Avon Township
1275 Avon Road
Rochester, MI 48063
(313) 656-4640

BLOOMFIELD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

In 1965, Bloomfield Township adopted a Master Plan of Storm Drainage which shows the alignments of existing and proposed storm drains. Since some of the proposed storm drains have not been constructed, the plan is not completely up-to-date.

Regulatory Programs

Bloomfield Township's Engineering Design and Standards Ordinance (Ordinance No. 167) includes specific provisions for site grading and for designing storm sewers. Although retention basins are sometimes required, specific design standards have not been adopted.

Storm drainage systems must be designed for a ten-year storm. In general, sufficient capacity must be provided in the storm sewer system to take fully developed upstream drainage into the system. If the development is not adjacent to a natural watercourse, buried storm sewers are required.

Whenever a site plan or subdivision plat is proposed, it is reviewed by the Township's staff and consulting engineer. If potential flooding hazards exist, retention or detention facilities may be required. In most cases, basins must be dewatered after a storm and be fenced. The rate of discharge from the basin depends on the size of the storm drain outlet.

In addition to retention/detention basins, natural drainage with swales and natural basins is sometimes encouraged. Due to the high land costs in Bloomfield Township, the integration of natural stormwater retention areas with open spaces has rarely been possible.

Easements for retention basin maintenance must be provided.

Proposed grading plans are reviewed by the Township as part of the site plan and subdivision plat review procedures. Specific design principles include the following:

- The smallest practical area of land should be exposed at any one time during development, and the exposure should be kept to the shortest practical time period;
- Temporary vegetation, mulching, and sediment basins should be used;

- Provisions should be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development;
- Permanent final vegetation and structures should be installed as soon as practical in the development;
- The development plan should be fitted To the topography and soil so as to create the least erosion potential; and
- Wherever feasible, natural vegetation should be retained and protected.

In addition to the grading plan review at an early stage in the governmental review process, Bloomfield Township assists the Oakland County Drain Commissioner with inspection and monitoring of activities subject to erosion and sedimentation control permits.

Operation and Maintenance Programs

Although Bloomfield Township does not own storm drains in the Township, some maintenance activities (such as unclogging and removal of debris) are carried out when emergencies arise.

The Township does, however, own and maintain all permanent stormwater retention basins. Typical maintenance activities include cutting grass, cleaning outlets, removing debris, and removing silt from the bottom of the basins. Silt removal is often needed every several months during the summer. Township maintenance activities are financed through general fund revenues.

For Futher Information:

Mr. James Scott, Director
Bloomfield Township Department of Public Works
4200 Telegraph Road
Bloomfield Hills, MI 48013
(313) 644-6161

BRANDON TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Brandon Township does not have adopted plans related to drainage and stormwater management.

Regulatory Programs

Proposed developments, including site plans and subdivision plats, are reviewed by Brandon Township to ensure that stormwater runoff is properly handled. The consulting engineer reviews certain development proposals and makes technical recommendations concerning drainage provision to the Townshp.

The Township's Subdivision Ordinance includes a statement that surface drainage in the subdivision must be properly handled. Specific requirements related to on-site retention of stormwater, however, have not been adopted.

Retention basins will be required for large subdivision plats which generate sizeable quantities of stormwataer runoff. To date, only one retention basin has been constructed as part of a subdivision plat. Brandon Township is rural in character (located in northern Oakland County) and few large development proposals have been submitted for consideration.

Grading plans for development proposals are carefully reviewed by the Township and the consulting engineer. The Township tries to minimize alterations to the natural topography in order to prevent erosion and retain the natural runoff pattern. Although the Township does not have a Wetlands Protection Ordinance, the Township typically requires developers to retain natural potholes and swamps unchanged for purposes of stormwater retention.

The Township's Zoning Ordinance includes a cluster housing option which is intended to encourage open space preservation. To date, the cluster housing option has not been used.

Operation and Maintenance Programs

Brandon Township does not own storm drains or retention basins. Retention basin maintenance would generally be the responsibility of the private landowner. When subdivision plats are proposed, the consulting engineer encourages maintenance agreements with homeowner associations.

For Further Information:

Mr. Leslie Wright
Supervisor, Brandon Township
395 Mill Street
Ortonville, MI 48462
(313) 627-2804

Mr. Fred Belschner
Consulting Engineer
Johnson and Anderson, Inc.
2300 Dixie Highway
Pontiac, MI 48055
(313) 334-9901

COMMERCE TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Commerce Township has not adopted any plans directly related to stormwater management, water quality, or drainage.

Regulatory Programs

Commerce Township manages stormwater through a series of ordinances and regulations. Stormwater is viewed as a resource which should be retained for beneficial uses, including groundwater recharge and lake protection. Regulations and standards related to stormwater which are administered by the Township include the Zoning Ordinance, Engineering Standards for Retention Basins, and the Land Fill Ordinance. Each of these regulatory programs is summarized below.

Although the Township has not adopted a wetlands protection ordinance, the value of wetlands for stormwater detention is recognized. When development plans are reviewed, the Planning Commission and Township Board often require the preservation of wetlands on the site.

Zoning Ordinance - Site plans consist of an overall plan for proposed developments and must include a general indication of storm sewers, site grading, drainage, retention basin(s) and/or other pertinent facilities. The Township's consulting engineer and staff review all proposals to insure conformance with Township requirements and sound development practices at an early stage in the review process.

Engineering Standards for Retention Basins - Specific requirements and standards for retention/detention basin design are included in adopted Engineering Standards. The standards are used in the review of site plans and subdivision plats. The following standards are included:

- Onsite stormwater retention is necessary for all developments in the Township;
- Basins must be designed to retain stormwater from the developed site. The allowable outflow from a retention basin shall be restricted to agricultural runoff, depending on the terrain. The volume of retention provided must equal or exceed the volume runoff required by the Oakland County Drain Commissioner's "Simplified Retention Basin Design Procedure" for a 10-year frequency storm;

- All retention basins should have a positive method in which to be dewatered (such as a gravity flow or pump outlet) unless it can be determined that the basin will be a permanent wet pond or that sufficient percolation through natural soils will develop;
- Fencing is required for retention area side slopes steeper than 1:4;
- If a sodded or rip-rapped overflow is not provided, the retention area must be large enough to receive two consecutive 100-year frequency rainfalls without an outlet.

In addition to retention/detention basins, the use of swales and open ditches for natural drainage and infiltration is encouraged.

Land Fill Ordinance - A "fill project" is not allowed without a permit from Commerce Township. The term "fill project" means the depositing, removal, redistribution or placement of soil on land in a manner which alters the pre-existing contour or elevation. Purposes of the ordinance include public health, preservation of natural resources, and prevention of nuisances.

The Building Department does not issue a permit unless it is satisfied that:

- The fill project will not impede drainage; and
- the fill project will not cause a change in the natural flow of surface waters with respect to adjoining properties.

The applicant may be required to indicate stormwater drainage provisions, both during and following completion of operations, including drainage pattern, runoff calculations, and detailed information for proposed new or improved drainage facilities. In addition, the applicant may be required to show details of provisions for controlling soil erosion and for controlling sedimentation onto contiguous properties and into water courses, both during and following completion of operation.

Finally, the plumbing section of the Building Code allows the Township to take action if drainage on an individual property becomes a nuisance.

Operation and Maintenance Programs

The Township does not own storm drains or retention basins.

Facility maintenance is the responsibility of homeowner associations or individual property owners. If proper maintenance activities are not carried out, the Township sometimes completes the maintenance and assesses benefiting property owners for the expense.

For Further Information:

Mr. William Mitchell, Building Inspector
Commerce Township
2840 Fisher Avenue
Walled Lake, MI 48088
(313) 624-0110

GROVELAND TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Groveland Township does not have adopted plans related to stormwater management.

Regulatory Programs

Stormwater management aspects of site plans and subdivision plats are reviewed when proposed plans are submitted to the Township. The consulting engineer reviews each proposal to insure that adverse effects on adjacent properties will not result and to insure that the proposal is in conformance wiTh township policies. Provisions for an engineering review of drainage proposals are included in the Site Plan Review Ordinance, the Subdivision Ordinance, and the Private Road Ordinance.

Because of the rural nature of Groveland Township, specific engineering standards or guidelines for drainage and on-site retention/detention have not been adopted. When site plans are proposed which necessitate stormwater management, the standards of the Oakland County Drain Commissioner are followed.

Grading plans related to proposed site plans and subdivision plats are also reviewed by the engineer. Reduction of erosion potential during construction is an important objective. Erosion and sedimentation control permits for development projects in Groveland Township (if required) are issued by the Oakland County Drain Commissioner.

Operation and Maintenance Programs

Groveland Township does not own or maintain storm drains or retention/detention basins.

When drainage and retention/detention facilities are constructed on private property, maintenance is the responsibility of the owner or the property owner association. An agreement with the Township to assure adequate maintenance is not required.

For Further Information:

Mr. Ken Wehner, Township Engineer
Wehner Engineering and Construction Consultants
6265 Tripp Road
Holly, MI 48442
(313) 634-4088

HIGHLAND TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Highland Township has not adopted plans related to drainage and stormwater management.

Regulatory Programs

When site plans and subdivision plats are submitted to Highland Township, the plans are reviewed by staff and consultants. Engineering design standards developed by the consulting township engineer are applied, although the standards have not been adopted officially by the Township Board.

In addition to reviewing development proposals for adequate drainage and stormwater facilities, natural areas are protected through the "natural hazards area" provisions of the Zoning Ordinance. Certain wetlands, streams, floodplains, areas with a high water table, and lake margins have been designated as preservation areas and development is prohibited. When plot plans for individual lots are reviewed, a setback of 65 feet from the lakeshore is encouraged.

The Zoning Ordinance includes a provision of Planned Unit Development, but the option has never been used. The Township encourages the preservation of a vegetated buffer strip between a development and a water body.

Site plans, subdivision plats, and private road developments are submitted to the consulting engineer for a technical review. The engineering design standards used as a guide for the technical reviews on stormwater include the following provisions:

(1) Project Grading

Project grading standards relate to lot grading during construction, street and lot drainage, and surface swales and easements. Provision for drainage (through filling, grading, or providing an outlet) must be made for all areas of the development. Every point of land in the development project must drain in at least one direction at a slope of at least one percent. Development within a floodplain is not permitted if such filling would cause possible flooding or cause backup in any moving body of water.

Grading of building sites to direct drainage to rear lot lines is unacceptable unless rear lot lines follow natural drainage courses or the route of a legally established county drain, or unless a rear yard storm drainage system is provided by the developer. In all other cases where rear lot drainage is permitted, surface drainage along rear lot lines must be accommodated through a swale designed for such a purpose.

All soil erosion and sedimentation control facilities intended for permanent use (including sedimentation basins, detention basins or ponds, and energy dissipating structures) must be constructed prior to the initiation of any other work.

(2) Storm Drainage System

Storm drainage facilities must be designed to serve all natural tributary areas. If the landowner's engineer cannot substantiate that the outlet has capacity to accommodate the proposed tributary flows without damage to downstream properties or facilities, provisions for stormwater detention must be included in the storm drainage system. Additional standards relate to hydrologic considerations, hydraulics, and construction standards. Standards for manholes, inlets and catch basins, and rear yard storm drain systems are also specified.

(3) Detention/Retention Ponds

On-site detention is required in all new developments to reduce stormwater outflow the agricultural runoff rate (0.2 cfs/acre). Roof top detention, parking lot detention, and basin (or pond) detention are permitted.

All detention ponds must have a positive method for dewatering, such as gravity flow or a pump outlet. The volume of detention for off-line basins must be sufficient for runoff from a 10-year frequency storm (for all acreage of the development contributing to the detention basin). When the detention basin is an in-line basin located in the line of flow of an existing drain or stream, a volume for a 50-year storm frequency must be provided. If the detention basin functions as a sediment basin, an outlet filter must be provided.

Retention ponds which are not to be used for aesthetic, agricultural, or consumptive reasons but serve the sole purpose of collecting storm runoff will be permitted only if no drains or natural drainage courses are reasonably accessible to the property. Such retention ponds are considered temporary measures, to be discontinued as soon as a drain becomes available to the development. The volume of the retention pond must be adequate to hold runoff from two 100-year frequency storms of two hours duration over the entire tributary area.

As reflected by these standards, dry detention basins are encouraged. Retention or detention is only required if the receiving stream is not large enough to carry the runoff without downstream flooding. Natural infiltration is encouraged as a supplement to facilities such as basins.

Operations and Maintenance Programs

Highland Township does not own or maintain storm drains or retention/detention facilities. In subdivisions, however, maintenance agreements with developers are signed in order to assure maintenance by the homeowner association.

For Further Information:

Ms. Helen Armstrong
Highland Township
Assistant Zoning Administrator
205 N. John Street
Highland MI 48031
(313) 887-3791

Mr. Robert Rothe, Consulting Engineer
Johnson & Anderson, Incorporated
2300 Dixie Highway
Pontiac, MI 48055
(313) 334-9901

HOLLY TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Holly Township has not adopted plans related to stormwater management.

Regulatory Programs

Stormwater management aspects of site plans are reviewed by the Holly Township Planning Commission and consultants. Existing and proposed grades, the direction of drainage, and retention areas must be shown on the site plans.

Environmental quality is one of the goals of Holly Township which is used in the review of site development plans. Procedures and standards for use in site plan reviews are provided in Article 8 of the Zoning Ordinance. One standard related to stormwater management is to minimize the extent of impervious ground cover and minimize the destruction of natural features which contribute to environmental quality.

When the magnitude of a proposed development is of such a scale as to dramatically have an effect upon an area greater than the immediate surrounding area, the Planning Commission may require an environmental review of the project.

Specific engineering design standards related to on-site detention or retention have not been adopted by Holly Township. The Township is rural and scenic in character, and few developments with off-site stormwater impacts have been proposed. When necessary, assistance from the Oakland County Drain Commissioner is requested.

Operation and Maintenance Programs

Holly Township does not own or maintain storm drains or basins. Maintenance agreements related to retention/detention basins are not required.

For Further Information:

Mr. Ronald F. Nino, Consulting Planner
11643 S. Saginaw
Grand Blanc, MI 48439
(313) 694-0170

INDEPENDENCE TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Independence Township has not prepared or adopted plans related to stormwater management or drainage.

Regulatory Programs

Grading and drainage plans for all subdivision plats and site plans are reviewed by Independence Township officials and their consulting engineers. Although engineering design standards related to drainage and on-site retention have not been adopted by the Township, definite policies and standards exist and are applied to development proposals. It is expected that engineering standards will be proposed by the Township's consulting engineers and adopted in 1981.

On-site retention/detention of stormwater with the discharge limited to the agricultural runoff rate is required in all cases. The type of approach taken to retention or detention, however, varies from site to site. The use of swales and natural depressions for natural infiltration is definitely encouraged. Township consultants typically recommend the preservation of open space areas (often in their natural state) and development setbacks from rivers and lakeshores.

Retention and detention basins must be designed for a 50-year storm runoff volume. Detention basins which are dry at most times are preferred. To encourage natural infiltration in swales and depressions, the placement of stones at the bottom has sometimes been required.

The Township adopted a Wetlands and Watercourse Protection Ordinance in 1979. The use of wetlands for stormwater detention is encouraged, and direct discharge of stormwater into lakes is not permitted. Before reaching a lake, stormwater must pass through a wetland area and/or sediment basin.

Several specific purposes of the Wetlands Ordinance relate to stormwater management or water quality:

- To prevent damage caused by erosion, scarification, sedimentation, turbidity, or siltation;
- To provide for the protection of soils capable of providing necessary filtration for the maintenance of aquifer stability;
- To secure safety from the dangers of flood and pollution to prevent loss of life, property damage and other losses and risks associated with flood conditions; and

- To prevent the alteration of the location, character and extent of natural drainage courses.

A wetlands permit is required for the construction or connection of a stormwater pipe or drainage facility from any residential site of two or more residences, commercial sites, parking area, or roadway. In addition, any land use involving discharge of silt, sediment, organic or inorganic materials, chemicals, fertilizers, flammable liquids, or any substance producing turbidity, except through an interceptor, retention or settling basin, filter, or treatment facility requires a permit.

Grading plans are reviewed to minimize the erosion potential during construction. Erosion and sedimentation control permits are issued by the Oakland County Drain Commissioner. The Township sometimes investigates complaints related to erosion on sites subject to county erosion permits, but does not actively monitor county permits.

Operation and Maintenance Programs

Independence Township does not own storm drains or retention/detention basins.

The Township does, however, conduct a maintenance program for all retention/detention basins in subdivision developments (five at the present time). Maintenance agreements are made with developers and added to deed restrictions providing for maintenance of facilities by the Township. Maintenance costs are assessed to the homeowners in the benefiting subdivision. Maintenance activities will include silt removal and removal or cleaning of stone filters.

For Further Information:

Mr. George Anderson
Superintendent of Public Works
Independence Township
90 N. Main Street
Clarkston, MI 48016
(313) 625-8111

Mr. Todd Kilroy, Planning Consultant
Community Planning and Management
48970 Schoenherr Road
Utica, MI 48087
(313) 247-7500

LYON TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Lyon Township does not have adopted plans related to stormwater management.

Regulatory Programs

Site plans and subdivision plats are reviewed by the Township for stormwater management purposes. As a general procedure, site plans and subdivision plats (regardless of size) are transmitted to the Oakland County Drain Commissioner for review purposes. If Lyon Township staff or the Planning Commission notes a potential problem, an engineering review by the Township is completed.

Lyon Township relies upon the stormwater management standards of the Oakland County Drain Commissioner. However, a number of principles are routinely followed when site plans and subdivision plats are reviewed:

- Natural infiltration of stormwater is encouraged and planned for, when soils allow;
- Stormwater retention is required, frequently at a level greater than the 10-year storm frequency; and
- Retention basins should be an amenity -- not a hazard -- when included in a development proposal.

A grading plan is a required element of a site plan or subdivision plat. The grading plan is reviewed to minimize the area of exposed soils during construction.

The Township is in the process of revising the Zoning Ordinance. Incentives for cluster development and open space preservation may be included in the new ordinance.

Operations and Maintenance Programs

Lyon Township does not own or maintain storm drains or retention/detention basins.

Homeowner associations are responsible for retention basin maintenance in subdivisions. Retention/detention basins which are connected to county drains are maintained by the Oakland County Drain Commissioner.

For Further Information:

Mr. William Oberti, Building Inspector
Lyon Township
57100 Pontiac Trail
New Hudson, MI 48165
(313) 437-2240

MILFORD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Milford Township has not prepared or adopted plans related to stormwater management or drainage.

Regulatory Programs

Milford Township officials and consulting engineers review development proposals for stormwater control provisions. Engineering design standards or other specific requirements for the stormwater review have not been adopted by the Township.

Although engineering design standards have not been adopted, the Township follows a series of operating policies which are applied in nearly all cases. On-site retention/detention of stormwater is required when the receiving stream is not large enough to receive the runoff volume, and discharge at an agricultural rate is required. Retention or detention basins are typically used to hold runoff. Although the type of basin which is constructed varies, many basins are dry detention basins with fences for safety purposes.

Natural infiltration of stormwater through the use of depressions and swales on the site is encouraged. Generally, a vegetated buffer strip between the development and the river or lake is required. The multiple use of open space and recreation areas for stormwater retention and detention is encouraged. A cluster development option which serves to increase common open space areas in the development is contained in the Zoning Ordinance of the Township, although it has not been used to date.

Grading plans submitted with site plans and subdivision plats are reviewed for the effect on drainage. Erosion control concerns are addressed by Oakland County when erosion and sedimentation control permits are issued. The Zoning Ordinance prohibits the discharge of runoff onto adjacent properties but specific requirements for rear yard drainage are not included.

Operations and Maintenance Programs

Milford Township does not own or maintain stormwater retention/detention basins or storm sewers. When development proposals are reviewed and on-site retention/detention of stormwater is required, no specific requirements for basin maintenance are included.

For Further Information:

Mr. Clarence Carlson, Building Inspector
Milford Township
1100 Atlantic
Milford, MI 48042
(313) 685-8731

OAKLAND TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

For the past ten years, Oakland Township has conducted a planning program for land use which has included the identification and mapping of sensitive resources, the development of environmental impact statement review requirements, the development of policies to guide the future development of the Township, and the preparation of a series of ordinances for regulating development.

The preparation of the Storm Water Management Plan and adoption in the spring of 1980 is the most recent part of the planning program. The Plan includes the following components:

- Statement of Principle;
- Storm Water Management Policies;
- Planning Requirements;
- Design Requirements;
- Standard Details for Blue-Green Detention Areas;
- Design Criteria for Low Density Developments with Roadside Ditches; and
- Guidelines for the Preparation of the Comprehensive Drainage Analysis.

An official drainage, floodplain, and wetlands map, a map of soil types, and technical information to assist engineers preparing development plans were also prepared as part of the stormwater management planning program.

The Storm Water Management Plan has been adopted by the Township and is used in reviewing site plans and subdivision plats. In effect, the Plan is a substitute for adopted engineering design standards for stormwater retention/detention.

The Statement of Principle is of central importance to the Plan. It reads as follows:

> "Oakland Township currently has an extensive system of natural drainage courses. These natural drainage courses are a valuable natural resource and a vital part of any drainage system. They have demonstrated their ability to safely carry the existing peak rates of runoff. It is, therefore, the intent of this plan to provide for the planning design of all future developments such that the

> peak rate of stormwater runoff from an area following development shall not significantly exceed the peak rate of runoff that occurred prior to development. As a result, the need to increase the capacity of the natural drainage courses will be minimized, making it easier to preserve them in their natural state."

Major stormwater management policies cover the following areas:

- No modification to a major drainage course is permitted when the primary purpose of the proposed modification is to increase the flow capacity of the drainage course.
- The 100-year floodplains of the major drainage courses shall be maintained in their natural state to the greatest extent possible.
- The maximum allowable discharge from a proposed development shall not exceed the existing peak rate from the area (for a 100-year frequency storm).
- Oakland Township is responsible for the maintenance of the storm drainage system, with the exception of drains under the jurisdiction of the Oakland County Drain Commissioner and the Oakland County Road Commission.

Planning requirements focus on the need to reduce the discharge of stormwater runoff from the site. As stated in the document, it is the intent of the Plan to minimize potential problems by:

- Limiting the rate at which stormwater runoff may be discharged from a development;
- Allocating sufficient space within the development to attenuate the peak-developed flow rates; and
- Encouraging development concepts which will minimize the increase in the amount and rate of runoff generated.

All development proposals must be accompanied by a comprehensive drainage analysis. The "primary system" of open and/or enclosed drains which is designed to carry runoff from storms up to a 10-year frequency and the "secondary system" which is capable of carrying runoff from storms up to a 100-year frequency without causing serious damage to adjacent properties must be identified and planned during the preliminary planning stages of a proposed development. The "primary system" and "secondary system" for drainage are viewed as two separate and distinct sub-systems.

All retention/detention facilities must have sufficient capacity to detain the excess runoff from a 100-year storm. Permanent easements for surface drainage and stormwater retention must be provided.

Natural drainageways should be used for conveying storm runoff whenever possible. The Plan notes the importance of natural drainage for improving water quality and minimizing the increase in the amount and rate of runoff generated. When new drains are required, the use of open channel drains is encouraged.

Open channel drains should be designed to avoid excessive velocities and erosion problems, and should have a natural appearance.

The "blue-green development concept" is defined as the use of selected portions of the site for the temporary detention of stormwater. "Blue-green" facilities may be either "green" when there is no standing water, or "blue" when there is permanent water. "Blue" areas must meet design standards for retention basins.

The use of roadside ditches in low density developments for conveyance of storm runoff is an additional plan policy. As noted in the Plan, "roadside ditches will improve the quality and minimize the increase in the amount and rate of stormwater discharged from the area."

Permanent surface drainage easements are required over the 100-year floodplain of all major drainage courses. Easements must prohibit any activities which would substantially alter the "natural state" of the floodplain. Easements are also required over the 100-year floodplain of all retention or detention basins, and over overland flow routes of the secondary drainage system which are not within the public right-of-way.

Design requirements detail engineering standards for detention facilities, the primary and secondary drainage systems, and floodplains. Each detention facility must have two outlets: a primary outlet for discharging flows up to a 10-year storm, and a secondary outlet for discharging flows up to a 100-year storm (at a rate not to exceed the existing peak flow).

When the "blue-green detention area" concept is used or when natural swales and depressions are used for stormwater detention, the total volume of runoff which must be retained in retention or detention basins may be reduced. This approach recognizes the function and value of natural areas for stormwater detention through natural infiltration.

The Storm Water Management Plan is based on the premise that significant runoff from development can be controlled through the site plan and subdivision plat review process. It is not anticipated that a system of storm drains through the Township will be necessary.

Regulatory Programs

Site plans and subdivision plats submitted to the Township are reviewed to identify potential drainage and erosion problems. A landscape plan, a grading plan, and a drainage distribution plan are components of each site plan. An environmental assessment must be prepared for each development proposal. The intent of the environmental assessment is to inject into the developer's planning process consideration of the characteristics of the land and the interests of the entire community. The complexity of the analysis must reflect the magnitude of the project, and is not intended to create a burden to the developer. The impact of the project on the natural drainage system is one specific requirement.

The Oakland Township Subdivision Control Ordinance specifies that the storm drainage system must be installed in accordance with plans approved by the township engineer. When county drains are involved, a letter or document of approval from the Oakland County Drain Commissioner must be submitted. Adequate and safe disposal or rear yard storm drainage must be provided, as prescribed by the township engineer. Grading must be carried out in accordance with requirements of the Erosion and Sedimentation Control Act and permit requirements of the Oakland County Drain Commissioner.

The Subdivision Control Ordinance specifies grading plan requirements. The grading plan must clearly show areas to be cleared or disturbed during grading and construction. After the grading plan is approved by the Township, the developer's engineer must set sufficient stakes in the field to clearly indicate the areas of the site which are not to be disturbed. A preconstruction meeting between the Township engineer, the developer's representative, and the developer's engineer is required to determine the work schedule and to assure that all parties are in agreement on the areas of the site that are to be preserved in their natural state. Prior to the start of any clearing and grading, the developer must deposit with Oakland Township sufficient funds to cover inspection costs. A cash bond or other assurances of performance in the amount to be determined by the Township is required to guarantee that the clearing and grading will conform with approved plans. The contractor must notify the Township at least two days prior to the initiation of the project. Similar provisions apply to site plan reviews in Oakland Township.

Oakland Township's Flood Plain and Wetlands Ordinance provides for the protection, preservation, proper maintenance, and use of township watercourses and wetlands in order to minimize disturbance to them and to prevent damage from erosion, turbidity or siltation, a loss of fish or other beneficial aquatic organisms, a loss of wildlife and vegetation, and natural habitat destruction. Water supply protection, water pollution protection, and safety from flood hazards are additional purposes. The ordinance requires the preparation of a master drainage plan showing wetlands, watercourses, floodplains, and floodways.

Construction or extension of drainage facilities (open or closed) and discharge to any lake, pond, stream, or watercourse require that a satisfactory method be provided for the proper management of pollutants. Permits are required to deposit any materials (including structures) or remove any material from floodplains, watercourses, or wetland areas. In reviewing permit applications, the Planning Commission and Township Board consider the probable effect of the proposed activity on water quality, fish or wildlife, adjoining wetlands and drainage areas, the ability of the resource to store water as well as the conveyance and replenishment functions, erosion control, inundation upstream and downstream, groundwater, and other factors. Reflecting requirements of the Michigan Environmental Protection Act, no approval is given if the action does, or is likely to pollute, impair or destroy a wetland, floodplain, or watercourse unless there are no feasible and prudent alternatives and unless the approval is consistent with the public interest. If approval is granted, the Townshp Board may establish reasonable conditions including performance bond requirements.

As reflected by these regulations, Oakland Township requires the protection of natural areas and wetlands. Open space preservation is also encouraged in zoning reviews and the Township Zoning Ordinance has provisions for a Planned Residential Development (PRD) Option.

Operation and Maintenance Programs

Oakland Township does not presently own or maintain storm drains or detention facilities. The recent adoption of the Storm Water Management Plan, however, has defined the Township's policy concerning maintenance of new retention and detention facilities; such maintenance will be the responsibility of the Township. Storm drain maintenance will remain the responsibility of the Oakland County Drain Commissioner, the Oakland County Road Commission, or private owners.

For Further Information:

Mr. Alfred J. Taylor
Supervisor
Oakland Township
4393 Collins Road
Rochester, MI 48063
(313 651-4440

Mr. Charles Biegun
Township Engineer
Giffels-Webster Engineers, Inc.
2731 Adams Road
Pontiac, MI 48057
(313) 852-3100

Ms. Carolyn Phelps, Town Clerk
Oakland Township
4393 Collins Road
Rochester, MI 48063
(313) 651-4440

ORION TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Orion Township has not adopted plans related to drainage and stormwater management.

Regulatory Programs

When site plans and subdivision plats are submitted to Orion Township, they are reviewed by staff and consultants. Engineering design standards developed by the consulting township engineer are applied. In addition, the Township's Flood Plain, Watercourses and Wetlands Protection Ordinance helps protect natural areas which hold and absorb stormwater runoff.

If development proposals are between one and three acres (or larger), the use of natural areas and swales for stormwater detention purposes is encouraged. If smaller parcels are involved, retention/detention basins and ponds are used. Basins are frequently designed to receive a stormwater volume equivalent to a 100-year storm frequency, and outflow from the site is restricted to the agricultural runoff rate.

Large lot residential developments (one and a half to three acre lots) require paved streets with open ditches for stormwater. Developments on smaller lots need the installation of storm sewers (underground) to transport stormwater to retention/detention facilities.

Design standards which are used by the township engineer as a guide when reviewing development proposals include the following:

(1) Project Grading

Project grading standards relate to lot grading during construction, street and lot drainage, and surface swales and easements. Provision for drainage (through filling, grading, or providing an outlet) must be made for all areas of the development. Every point of land in the development project must drain in at least one direction at a slope of at least one percent. Development within a floodplain is not permitted if such filling would cause possible flooding or cause a backup in any moving body of water.

Grading of building sites to direct drainage to rear lot lines is unacceptable unless rear lot lines follow a natural drainage course, unless rear lot lines follow the route of a legally established county drain, or unless a rear yard storm drainage system is provided by the developer. In all other cases where rear lot drainage is permitted, surface drainage along rear lot lines must be accommodated through a swale designed for such a purpose.

All soil erosion and sedimentation control facilities intended for permanent use (including sedimentation basins, detention basins or ponds, and energy dissipating structures) must be constructed prior to the initiation of any other work.

(2) Storm Drainage System

Storm drainage facilities must be designed to serve all natural tributary areas. If the landowner's engineer cannot substantiate that the outlet has capacity to accommodate the proposed tributary flows without damage to downstream properties or facilities, provisions for stormwater detention must be included in the storm drainage system. Additional standards relate to hydrologic considerations, hydraulics, and construction standards. Standards for manholes, inlets and catch basins, and rear yard storm drain systems are also specified.

(3) Detention/Retention Ponds

On-site detention is required in all new development to reduce stormwater outflow to the agricultural runoff rate (0.2 cfs/acre). Roof top detention, parking lot detention, and basin (or pond) detention are permitted.

All detention ponds must have a positive method for dewatering, such as gravity flow or pump outlet. The volume of detention for off-line basins must be sufficient for a 10-year frequency storm (for all acreage of the development contributing to the detention basin). When the detention basin is an in-line basin located in the line of flow of an existing drain or stream, a volume for a 50-year storm frequency must be provided. If the detention basin functions as a sediment basin, an outlet filter must be provided.

Retention ponds which are not to be used for aesthetic, agricultural, or consumptive reasons but serve the sole purpose of collecting storm runoff will be permitted only if no drains or natural drainage courses are reasonably accessible to the property. Such retention ponds are considered temporary measures, to be discontinued as soon as a drain becomes available to the development. The volume of the retention pond must be adequate to hold runoff from two 100-year frequency storms of two hours duration over the entire tributary area.

These engineering design standards have not been officially adopted by Orion Township.

The Flood Plain, Watercourses, and Wetland Protection Ordinance recently adopted by Orion Township has several stated purposes:

1. To provide for the protection, preservation, proper maintenance, and use of township floodplains, watercourses, and wetlands in order to minimize disturbances to them and to prevent damage from erosion, turbidity or

siltation, a loss of fish or other beneficial aquatic organisms, a loss of wildlife and vegetation and/or from the destruction of the natural habitat thereof.

2. To provide for the protection of the Township's potable fresh water supplies from the dangers of drought, overdraft, pollution, or mismanagement which will affect human, animal or plant life.

3. To secure safety from damaging flood heights and velocities; to reduce the financial burdens imposed upon the community through rescue and relief efforts; to prevent loss of life, property damage or other losses and risks associated with flood conditions; to preserve the location, character and extent of natural drainage courses.

Proposals to dredge or fill any floodplain, watercourse, or wetland area designated on the official maps requires a permit. Proposals to use land for outdoor recreation which involves structures also require permits.

Due to detrimental effects on water quality and life in Orion Township, the following acts are prohibited:

Construction, extension, enlargement, or connection of any conduit, pipe, culvert, or open or closed drainage facility erected for the purpose of carrying stormwater runoff from any:

- residential use;
- commercial or industrial site;
- parking areas;
- paved or unpaved public or private roads; or
- any other use which would permit the discharge of silt, sediment, organic or inorganic materials, chemicals, fertilizers, etc.

Discharge may be permitted if a retention or settling basin, filter, or treatment facility designed to control and eliminate the pollutant before discharge into any lake, pond, stream, watercourse, or wetland is constructed.

The management of stormwater runoff for water quality purposes is a byproduct of this ordinance.

Grading plans for site plans and subdivision plats are also reviewed by the township to insure proper drainage.

Operation and Maintenance Programs

Orion Township does not own or maintain storm drains or retention/detention basins as a matter of policy. Retention basin maintenance for one development, however, is the Township's responsibility.

For Further Information:

Mr. Dale Anderson
Building Inspector
Orion Township
2525 Joslyn Road
Lake Orion, MI 48035
(313) 391-0304

Mr. Charles Finski
Consulting Engineer
Johnson and Anderson, Inc.
2300 Dixie Highway
Pontiac, MI 48055
(313) 334-9901

OXFORD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Oxford Township has not adopted plans related to drainage or stormwater management.

Regulatory Programs

The Township has adopted engineering design standards related to stormwater management and on-site retention. On-site retention or detention is required in all cases where the receiving stream does not have sufficient capacity to handle the runoff. Detention basins with outlets must be designed to hold stormwater equivalent to the runoff from from a 10-year frequency storm. Retention basins without outlets must hold a stormwater volume equivalent to two 100-year frequency storms of two hours duration over the entire tributary area.

Oxford Township is characterized by sand and gravel soils which rapidly absorb stormwater and help to avoid flooding problems. for this reason, only two detention basins have been required to date. The Township prefers dry detention basins in order to avoid maintenance problems.

Site plans and plot plans (for individual residential lots) are reviewed by the Township to insure proper drainage. Site drainage onto adjacent properties is not allowed if it will exceed the predevelopment rate. Site drainage (or the need for rear yard drainage requirements) is typically not a problem because of the soil conditions. In some cases, leaching pits have been required on commercial property.

Grading plans for subdivisions and site plans are reviewed to reduce erosion potential from the site and to insure adequate drainage. Although the Oakland County Drain Commissioner is reponsible for the issuance of erosion and sedimentation control permits in Oakland Township, the Township actively assists with monitoring and inspections. In addition to notifying the county when obvious violations occur, the Township reviews the detailed erosion and sedimentation control plan for individual sites to insure that requirements imposed by the Oakland County Drain Commissioner are being followed.

Operation and Maintenance Programs

Oxford Township does not own or maintain storm drains or retention/detention facilities. The Township requires that developers assign maintenance responsibilities to homeowner associations through deed restrictions (when retention facilities are required).

For Further Information:

Mr. Larry Ericksen, Building Inspector
18 W. Burdick Street
Oxford, MI 48051
(313) 628-9787

PONTIAC TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The Township's Master Plan includes policies and maps related to floodplains and floodplain development. Proper floodplain development is considered to be interrelated with stormwater management.

Regulatory Programs

Through the Township's Zoning Ordinance, site plans are reviewed for consistency with adopted policies and standards. Subdivision plats are reviewed for consistency with adopted policies and standards. Subdivision plats are reviewed in accordance with requirements of the Subdivision Ordinance. Adopted engineering standards (Ordinance 225) specifies many of the requirements for storm sewers and retention basin design, and open channels or ditches.

Selected design requirements are as follows:

1. Engineering Standards for Storm Sewer Design:

   - All storm drain systems shall be designed to carry the maximum anticipated storm runoff flowing full from the entire contributing acreage. The 10-year storm frequency must be used in completing calculations.

2. Engineering Standards for Storm Water Retention:

   - On-site retention will be required if the storm drainage outlet is incapable of handling the developed runoff.
   - The allowable outflow from a retention basin shall be restricted to agricultural runoff, (0.2 cfs/per acre). The volume of retention must equal or exceed the value required by the Oakland County Drain Commissioner's "Simplified Retention Basin Design Procedure" for a 10-year frequency storm.
   - All retention basins must have a positive method in which to be dewatered, such as by gravity flow or pump outlet.
   - Retention volume must be provided for all acreage contributing to the retention basin, including offsite acreage.
   - Fencing will be required as needed, depending upon basin depth, steepness of slope, etc.

- All retention basins must be permanently stablized to prevent erosion.

3. Engineering Standards for Drainage Structure, Open Channels, and/or Ditches:

- All drainage structures shall be constructed according to the latest issue of Standard Details and Specifications of the Michigan Department of State Highways.
- All drainage systems discharging into lakes, creeks, open drains or natural drainage courses must terminate with a Michigan Department of State Highways' standard headwall and the first manhole upstream of a headwall shall have a two foot deep sump.
- Leach basins will not be recognized as an acceptable method of providing adequate storm drainage.
- Side slopes of all open channels and/or ditches shall be not steeper than 1:4.
- Special erosion protection shall be placed at bends, drain inlets or outlets or other location as required in all open channels and/or ditches.

Athough not specifically stated in the engineering standards, it is the general policy of Pontiac Township to require the use of natural depressions and swales for natural infiltration whenever possible. If the site is not large enough to absorb all stormwaters, construction of basins is required. The use of parking lots for temporary detention is another typical stormwater management measure.

Pontiac Township also administers an "Ordinance to Regulate the Removal of Topsoil, Subsoil, Sand, Gravel and Other Materials and the Moving and Filling of Land" (Ordinance No. 260). In addition to the regulation of sanitary landfill construction, excavation, and related activities, the ordinance regulates fill activities in floodplains and wetlands. A wetland protection policy, however, is not included in the fill ordinance.

Operation and Maintenance Programs

Pontiac Township does not own or maintain storm drains or retention/detention basins. Engineering standards for retention/detention basins specifically state that maintenance must be provided by the property owner or owners (the developer is responsible for making appropriate arrangements). As stated, the Township will not accept the responsibility for the maintenance of any retention basin.

For Further Information:

Mr. Harry Reese, Building Inspector
1827 N. Squirrel
Pontiac, MI 48057
(313) 373-5200

ROSE TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Rose Township does not have adopted stormwater management plans.

Regulatory Programs

Rose Township is a very rural community and few subdivision plats or site plans have been proposed. The minimum residential lot size will soon be increased to one and one half acres.

All development proposals are reviewed by the township's consulting engineer. If a development potentially had stormwater runoff problems, a stormwater review would be completed. The Township does not have adopted policies or standards related to drainage or stormwater runoff. Working policies or approaches have not been developed because there has not been a need to do so.

Operation and Maintenance Programs

The Township does not own or maintain storm drains or retention/detention basins.

For Further Information:

Mr. Todd Kilroy, Planning Consultant
Community Planning and Management
48970 Schoenherr Road
Utica, MI 48087
(313) 247-7500

SPRINGFIELD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Springfield Township has not adopted plans related to stormwater management or drainage.

Regulatory Programs

Springfield Township has adopted "Storm Water Management Program Policy and Design Standards for Storm Water Holding Facilities" which are applied when site plans and subdivision plats are reviewed. All new developments within the Township must have a stormwater holding facility meeting the design requirements. In addition, adequate provisions must be made for proper drainage of stormwater runoff from each residential lot within a subdivision.

In order to facilitate the technical review by staff and consultants, Springfield Township requires the submittal of basic information about site characteristics. For example, soil drainage characteristics must be mapped when subdivision plats are submitted for preliminary review. Soils which are well-drained, subject to ponding, and susceptible to flooding must be identified.

Design standards related to detention basins which hold stormwater runoff for a short period of time before releasing it and retention basins which hold the water for a considerable length of time are specified. On-site detention facilities must reduce stormwater outflow from the site to an agricultural runoff level (0.2 cfs/acre). Basins, parking lot detention, or roof top detention are specifically permitted.

All detention basins must be capable of complete dewatering by gravity. Pump discharge is only allowed under special circumstances. A paved swale with a minimum grade of 1% must be provided from the inlet to the outlet of the basin. Side slopes may be no steeper than one foot vertical to five feet horizontal.

A 12-foot wide access easement and a 10-foot wide paved access road must be provided for all detention basins. A 10-foot wide maintenance strip around the perimeter of the basin must also be provided. The use of a detention basin for sediment control purposes, however, may only be a temporary measure.

Stormwater volume equal to the runoff of a 10-year frequency storm must be detained. All sites greater than seven acres in size must provide a 6 inch diameter outlet pipe (or equivalent) to the receiving drainage course.

Parking lot detention is permitted if it does not adversely affect the functioning of the business or create a public nuisance. The required storage

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volume is the same as for basin detention. Where applicable, up to twelve inches of stormwater storage will be permitted. Roof top detention is only permitted on new buildings with specially designed structures.

Retention ponds constructed solely for stormwater management purposes are permitted only if no drain or natural drainage course for discharging of a detention pond is reasonably available to the developer. Retention basins are considered temporary measures, to be discontinued as soon as a drain becomes available to the development. Retention basins must be designed to hold runoff from two consecutive 100-year frequency storms of infinite duration. A comprehensive soil investigation including a determination of groundwater levels must be furnished. All requirements related to detention ponds also apply to retention ponds.

Ground cover must be established immediately following the construction of a detention or retention basin. The ground cover must be established on basin bottoms, side slopes, a 10-foot wide maintenance strip, and an additional 10 foot width around the entire perimeter of the basin.

In addition to retention and detention basins, Springfield Township encourages natural infiltration of stormwater through the use of swales and natural depressions whenever possible. This policy is supported by the "natural features" preservation requirement of the subdivision ordinance. As stated in the ordinance:

> "The natural features and character of lands must be preserved wherever possible. Due regard must be shown for all natural features such as large trees, natural groves, water courses and similar community assets that will add attractiveness and value to the property if preserved. The preservation of drainage and natural stream channels must be considered by the proprietor and the dedication and provision of adequate barriers (dams, bulkheads, retaining walls, etc.) where appropriate, shall be required."

This policy helps to protect wetlands areas on the site which help absorb and detain stormwater on the site.

The Township has adopted "Grading and Surface Drainage Design Standards" which include requirements for drainage on individual sites. In general, stormwater should drain from the front of the house to the front of the lot and from the rear of the house to the rear of the lot. Drainage across adjacent lots must be avoided whenever possible. If drainage across an adjacent lot is necessary, an easement must be obtained from the adajcent landowner.

Springfield Township's Engineering Design Standards include provisions for variances in hardship cases. The following criteria are reviewed when considering hardship cases:

- Special circumstances would deprive reasonable uses;
- The variance is necessary for preservation and enjoyment of a substantial property right;

- The variance is not detrimental to public welfare or injurious to other property; and

- The variance will further the written objectives and policies of the Township. All of these criteria must be met before a variance is granted.

Erosion and sedimentation control considerations are reflected in the engineering design standards as well as the Subdivision Ordinance. As stated in the engineering design standards, grading must be accomplished in a manner that adheres to required soil erosion and sedimentation control devices and sequences and must not alter or in any way affect offsite or adjacent natural drainage.

Erosion control permits for developments in Springfield Township which are one acre or more in size or within 500 feet of a watercourse are issued by the Oakland County Drain Commissioner. For smaller subdivision plats, however, Springfield Township completes its own erosion and sedimentation review. Erosion and Sediment Control Principles are listed in the section of the subdivision ordinance titled "Grading and Site Drainage." Principles listed include the following:

- The smallest practical area of land should be exposed at any one time;

- When land is exposed during development, the exposure should be kept to the shortest practical period of time;

- Temporary vegetation and/or mulching should be used to protect critical areas exposed during development;

- Sediment basins should be installed and maintained to remove sediment from runoff waters from land undergoing development;

- Provision should be made to effectively accommodate the increased runoff caused by changed soil and surface conditions after development;

- The permanent final vegetation and structures should be installed as soon as practical in the development;

- The development should be fitted to the topography and soil so as to create the least erosion potential; and

- Whenever feasible, natural vegetation should be retained and protected.

These principles are very similar to principles used by the Oakland County Drain Commissioner when issuing permits in accordance with the Michigan Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972). The enforcement of these requirements by Springfield Township provides a comprehensive approach to controlling erosion during construction.

Operation and Maintenance Programs

Springfield Township does not operate or maintain storm drains or detention/retention facilities.

For detention/retention facilities, however, an agreement for maintenance must be executed with the developer of a subdivision prior to final approval of the subdivision plat. Property deed restrictions must provide for maintenance by the subdivision homeowner association. If the homeowner association does not properly maintain the basins, the Township may complete necessary maintenance and assess the property owners.

For Further Information:

Mr. Collin W. Walls, Supervisor
Springfield Township
650 Broadway
Davisburg, MI 48019
(313) 634-3111

WATERFORD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Although Waterford Township has not completed a stormwater management plan, an inventory of the present drainage system (including delineation of drainage districts) has been completed. It is the operating policy of the Township that new developments should not violate the existing drainage pattern. When individual development projects are considered, they are compared with the present drainage system for the area.

Regulatory Programs

Detailed requirements and standards related to drainage and stormwater management are included in Waterford's Site Plan Review Ordinance (Ordinance #99). All proposed commercial, industrial, and multiple-family developments are subject to requirements of the Site Plan Review Ordinance. When subdivision plats are reviewed by the Township, similar standards and requirements related to stormwater management are applied.

Site plans and subdivision plats must show existing drainage courses and lake or stream elevations, proposed site grading, storm sewers, retention basins, and other pertinent drainage features. If easements have been obtained for stormwater management purposes, they must also be delineated. In addition, construction plans and specifications must show proposed site grading and the proposed route of flow of surface drainage. Side lot swales carrying runoff to the front of lots is preferred in subdivision plats. Grading which would allow surface runoff onto adjacent properties is discouraged.

The Site Plan Review Ordinance includes detailed engineering design standards to guide land owners and developers who are preparing site plans. Standards relate to storm drainage systems, leaching basins, debris or sedimentation basins, stormwater retention, and easements. Provisions related to stormwater retention include the following:

- Stormwater retention, detention, or the controlled release runoff shall be required for all new commercial, industrial, multiple, office and condominium developments, whenever the design engineer is unable to substantiate the adequacy of the receiving body of water or storm drainage facility.
- Release rates for stormwater retention facilities shall comply with the requirements of the governmental unit having jurisdiction of the receiving facility. For example, facilities releasing stormwater to county drains must meet the requirements of the Oakland County Drain

Commissioner to restrict the release rate to the undeveloped discharge rate, or release rates which are consistent with the design of the receiving drains.

- Generally, side slopes shall be no steeper than 3:1. Slope bottom of retention basin to outlet, to provide for total dewatering. Provide chain link fence. Provide 12 foot wide easements for access.

In some cases, basins with gradually sloping sides have been approved. In such cases, fences are not needed. Although not written in the Site Plan Review Ordinance, retention basins with a capacity to handle runoff from a 50-year storm are recommended.

Waterford Township does not encourage a single type of retention/detention facility or approach. Natural infiltration of stormwater through swales and depressions is encouraged if the site has no available drainage outlet. When a natural depression or low-lying area is large enough to serve as a detention basin, the operating standard of Waterford Township is that natural basins hold the volume of stormwater runoff from two 100-year storms. Parking areas frequently serve as stormwater detention areas.

When soils are sandy, leaching basins which collect surface runoff and discharge underground are allowed. Leaching basins may be catch basins with finger drains for subsurface disposal or dry wells. Leaching basins are usually encouraged on small sites (smaller than one acre) when optimum soil conditions (soil composed entirely of coarse sand, gravel, or a coarse sand-gravel mixture) are present.

If storm drain pipes are needed, enclosed drains to accommodate a three-year storm volume are required. The Township is concerned about liability for damages or injuries resulting from open ditches and standing water. Reflecting the small size of the storm drain pipes, on-site retention or detention is required in nearly all developments.

Grading plans for proposed developments are reviewed to minimize erosion during construction. Debris or sedimentation basins are required at the lower terminus of all storm drainage outlets to lakes or rivers in order to reduce sedimentation after construction has been completed. Erosion and sedimentation control permits for certain developments are issued by the Oakland County Drain Commissioner. The Township notifies the County if major violations or citizen complaints are registered (the Township does not monitor county permits on a regular basis).

Waterford Township intends to adopt a floodplains and wetlands protection ordinance as soon as detailed floodplain mapping has been completed.

Operation and Maintenance Programs

The Township does not own or maintain storm drains. Waterford Township doe. however, have a retention basin maintenance program which is actively implemented. When a development is approved by the Township developers are required to make two types of payments. The first payment is to provide against improper storm drain facility construction and is placed into a two-year escrow account. The second payment (averaging $2500-$5000/development) is placed in a perpetual maintenance fund. Interest on the fund is used to cover Township costs related to facility maintenance. Typical maintenance activities include outlet cleaning, debris removal, and, in extreme cases, the cutting of grass.

For Further Information:

Mr. William Goga, Township Engineer
Waterford Township
5200 Civic Center Drive
P.O. Box 428
Waterford, MI 48095
(313) 674-3111

WEST BLOOMFIELD TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

West Bloomfield Township has an ongoing stormwater management planning program which is expected to lead to the adoption of stormwater management policies and regulations. The planning program has two components: (1) a resource data base component, and (2) an engineering and management policy component.

The purpose of the resource data base component is to provide site-specific data which can be used for both the design and review of site plans and subdivision plats. During 1975, a Master Plan Update Program was undertaken and an inventory of environmental resources prepared. Small-scale county-wide data provided by the Oakland County Planning Division was enlarged on Township based maps to indicate woodlands, topography, water generative areas (preliminary definition of wetlands and woodlands), soils data, and jurisdictional park and open space areas. Using the maps and both vertical and oblique aerial photography, a composite overlay of all environmentally significant features was prepared.

In the past several years, maps showing topography, wetlands, and major and minor drainage basins have been delineated at a scale of 1" equals 200'. An overlay of property ownership boundaries has also been added to this base map data.

In the Spring of 1980, the second phase of the stormwater management planning program was initiated. The second phase includes the development of drainage policy recommendations and methods for policy implementation. The intent of the planning program is to avoid stormwater problems which are expensive to correct after development has occurred, as well as to provide solutions to existing drainage problems. The concept is to work with the natural drainage and wetland systems as much as possible to achieve stormwater control in new development areas. This approach is in contrast to the philosophy of constructing major networks of expensive storm drains. The Plan will be based on the philosophy that stormwater runoff is a natural resource to be protected, utilized, and retained in the area to the greatest extent possible. Both water quality and water quantity control will be goals of the Plan.

Regulatory Programs

West Bloomfield Township reviews site plans and subdivision plats to insure that Township policies are followed. Three aspects of the Township's regulatory program which are directly related to stormwater management include:

- On-site retention/detention requirements;
- Wetland and Flood Plain Protection Ordinance; and
- Cluster development options included in the Zoning Ordinance.

Erosion and sedimentation control permits are issued by the Oakland County Drain Commissioner, as required by the Michigan Erosion and Sedimentation Control Act (Act 347, P.A. of 1972). However, grading plans for plats and site plans are reviewed by West Bloomfield Township at an early stage in the development review process to insure that the site design and layout does not suggest future erosion problems.

Each of the major regulatory programs of West Bloomfield Township related to stormwater management is summarized below.

1. On-Site Stormwater Retention Requirements:

   Although West Bloomfield Township has not adopted engineering design standards related to stormwater retention/detention, the Township has required on-site detention of stormwater for new developments for many years. It is anticipated that amendments to the Zoning Ordinance will be made following the completion of the Stormwater Management Plan to provide adopted regulations for retention and detention. At present, a "Site Plan Review" form provides written notification to developers of the Township's requirements.

   West Bloomfield Township requires that stormwater volume equivalent to runoff from a 100-year frequency storm be retained or detained on the site. This requirement is applied to large and small site plans and subdivision plats. Detention basins designed as aesthetic features (unfenced, sodded, and landscaped with shallow slopes (maximum 5:1) are typical. A maximum of four inches of stormwater detention is allowed in parking lots of small sites.

   The use of the natural drainage channels and areas on the site for stormwater routing and detention is always encouraged. For example, small ponds with wetlands may be enlarged to meet stormwater retention/detention requirements. The ability of wetlands to hold stormwater is recognized as being extremely important, although the protection of wetlands on the site does not affect the required storage volume for retention and detention facilities.

   Retention requirements reflect West Bloomfield Township's concerns about water quality as well as flooding.

2. Wetlands and Flood Plain Protection Ordinance:

   In 1977, the West Bloomfield Township Board adopted the Wetlands and Flood Plain Protection Ordinance to address problems related to urbanization. As stated in the ordinance, the Township found that rapid growth and increasing demands on natural resources were increasing the potential for flooding of lowlands and wetlands. It was found that watercourses, wetlands, and other natural resources were being despoiled and polluted.

The physical, aesthetic, recreation, and economic benefits of wetlands were noted.

Original wetland and flood plain maps were prepared at 1:200 scale by the U.S. Department of Agriculture, Soil Conservation Service, based on the soil mapping that had recently been completed. Subsequent refinements included the preparation of 1:200 scale mapping (section by section) correlated with topographic mapping.

Purposes of the ordinance include the following:

- To protect wetlands and watercourses in order to minimize disturbance and to prevent damage from erosion, loss of fish or other beneficial aquatic organisms, and a loss of wildlife and vegetation.
- To protect potable fresh water supplies in the Township from drought, overdraft, pollution, or mismanagement.
- To provide flood safety and to preserve the location, character, and extent of natural drainage courses.
- To provide for the enforcement of the ordinance and coordination of enforcement with appropriate local, county, and state statutes.

All operations affecting floodplains, floodways, watercourses, and wetlands require a permit. The Township has adopted official maps delineating areas subject to the permit requirements. Danger of water pollution resulting from floods is one of a number of factors which are considered by the Planning Commission and Township Board in reviewing permit applications.

The following acts are prohibited unless an approved wetland or flood plain permit is issued:

- Deposit or removal of material from any watercourse or wetland, or from any area within 25 feet of the same.
- Enlargement or alteration of any lake, stream, or other naturally occurring waterway.
- Construct or connect any drainage facility erected for the purpose of carrying stormwater runoff from any residential site of two or more single-family or multiple residences, commercial sites, parking areas, paved or unpaved private or public roads, or any other land use permitting discharge of silt, sediment, organic or inorganic materials, chemicals, fertilizers, flammable liquids, or any substance producing turbidity, except through an terceptor, retention or settling basin, filter or treatment facility designed to control and eliminate the pollutant before discharge to any lake, pond, stream, or watercourse.
- Construct or connect any waste treatment plant discharge to any lake, pond, stream, water or drainage course or wetland, except in accordance with county, state, and federal pollution control laws for improving and maintaining clean natural water.

- **Pump surface waters for irrigation or sprinkling other than for individually owned single-family homes, except where the waterway is wholly contained within the user's property.**

Wetland permit review is based upon the specific impact of the proposed activity as it relates to:

(1) Water quality, including filtering action;

(2) Fish or wildlife, including their habitats, damage, or change;

(3) Effect on adjoining wetland or drainage areas and watertables;

(4) Economic impact;

(5) Land use for which the property is zoned or planned; and

(6) Recreational impact.

The net result has been to retain the majority of wetland areas in their natural condition. No legal challenges have been encountered to date.

3. Cluster Development and Open Space Subdivision Options:

West Bloomfield Township strongly encourages the preservation of open space through single-family cluster development and open space options in its Zoning Ordinance. More than thirty cluster developments have been constructed. Cluster development serves to reduce the amount of mass grading on the site, thereby reducing erosion and helping to preserve natural amenities. Open space areas which receive special attention when reviewing cluster development proposals include woodlands, floodplains, wetlands, and unique natural features.

The allowable densities are substantially the same as for single-family subdivisions, and twenty-five percent density credit is given for wetland and flood plain areas.

Plot plans for individual homes are not reviewed for drainage purposes unless they are part of a larger subdivision. When drainage problems between adjoining properties arise, however, the Township helps residents work out satisfactory solutions.

Of special note is the Township's consideration of areas outside the immediate property during development plan reviews. Developers are required to submit information concerning lands 100-feet on all sides of the subject property to assist the Township in the development review.

Operation and Maintenance Programs

West Bloomfield Township does not own or maintain storm rains or retention/detention facilities.

If retention or detention facilities are included in a subdivision developed through a cluster option, the township enters into a maintenance agreement with the developer which provides for maintenance of any facilities by the homeowner association. Maintenance of facilities in other developments are the responsibility of individual owners.

For Further Information:

Mr. Frank Reynolds
Director of Planning
West Bloomfield Township
4460 Orchard Lake Road
West Bloomfield, MI 48033
(313) 682-1200

WHITE LAKE TOWNSHIP

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

White Lake Townshp has not developed or adopted plans related to drainage and stormwater management.

Regulatory Programs

Engineering design standards developed and recommended by White Lake Township's consulting engineers have been adopted by the Township. Proposed revisions in the standards are being considered by the Township Board.

Design standards related to stormwater management include standards for: (1) project grading; (2) the storm drainage system; and (3) detention/retention ponds. Standards which are being considered by the Township are highlighted below. In most cases, these standards are closely related to the standards adopted by White Lake Township. The standards are applied when site plans and subdivision plats are reviewed.

(1) Project Grading

Project grading standards relate to lot grading during construction, street and lot drainage, and surface swales and easements. Provision for drainage (through filling, grading, or providing an outlet) must be made for all areas of the development. Every point of land in the development project must drain in at least one direction at a slope of at least one percent. Development within a floodplain is not permitted if such filling would cause possible flooding or cause a backup in any moving body of water.

Grading of building sites to direct drainage to rear lot lines is unacceptable unless rear lot lines follow natural drainage courses or the route of a legally established county drain, or a rear yard storm drainage system is provided by the developer. In all other cases where rear lot drainage is permitted, surface drainage along rear lot lines must be accommodated through a swale designed for such a purpose.

All soil erosion and sedimentation control facilities intended for permanent use (including sedimentation basins, detention basins or ponds, and energy dissipating structures) must be constructed prior to the initiation of any other work.

(2) Storm Drainage System

Storm drainage facilities must be designed to serve all natural tributary areas. If the landowner's engineer cannot substantiate that the outlet has capacity to accommodate the proposed tributary flows without damage to downstream properties or facilities, provisions for stormwater detention must be included in the storm drainage system. Specific standards relate to hydrologic considerations, hydraulics, and construction standards. Standards for manholes, inlets and catch basins, and rear yard storm drainage systems are also specified.

(3) Detention/Retention Ponds

On-site detention is required in all new development to reduce stormwater outflow to the agricultural runoff rate (0.2 cfs/acre). Roof top detention, parking lot detention, and basin (or pond) detention are permitted.

All detention ponds must have a positive method for dewatering, such as gravity flow or pump outlet. The volume of detention for off-line basins must be sufficient for a 10-year frequency storm (for all acreage of the development contributing to the detention basin). When the detention basin is an in-line basin located in the line of flow of an existing drain or stream, a volume for a 50-year storm frequency must be provided. If the detention basin functions as a sediment basin, an outlet filter must be provided.

Retention ponds which are not to be used for aesthetic, agricultural, or consumptive reasons but serve the sole purpose of collecting storm runoff will be permitted only if no drains or natural drainage courses are reasonably accessible to the property. Such retention ponds are considered temporary measures, to be discontinued as soon as a drain becomes available to the development. The volume of the retention pond must be adequate to hold runoff from two 100-year frequency storms of two hours duration over the entire tributary area.

In White Lake Township, the individual site characteristics are reviewed to determine effective approaches to stormwater management. Many different types of basins have been constructed in the Township. If the site permits, natural infiltration of stormwater into the soils is encouraged. In one development, a seepage basin (fenced, without an outlet) was permitted.

Reflecting the scenic, rural character of the Township, the Township Board has taken special steps to protect scenic areas and wetlands. In some developments, deed restrictions have been required for the protection of natural areas. In one development, the Township prohibited development in the floodplain and the developer subsequently deeded the land to Oakland County for park purposes.

A wetlands ordinance is presently being developed which will reflect the policy of the Township to protect wetlands.

The Township is concerned about erosion problems related to development proposals. The Township notifies the Oakland County Drain Commissioner when violations of county erosion and sedimentation control permits are noted.

Operation and Maintenance Programs

White Lake Township does not own or maintain storm drains or retention/detention basins. As specified in the engineering design standards, an agreement for operation and/or maintenance of the detention basin system must be executed between the developer and the Township prior to the issuance of building permits. White Lake Township requires the inclusion of the provision that if a subdivision homeowner association fails to maintain basins, the Township may do so and assess costs to the residents.

For Further Information

Mr. James Reid, Supervisor
White Lake Township
7525 Highland Road
White Lake, MI 48042
(313) 698-33300

(Information about the engineering design standards is available from Johnson & Anderson, Incorporated, Consulting Engineers.)

APPENDIX B

APPENDIX B

OAKLAND COUNTY CITIES*

STORMWATER MANAGEMENT PROGRAM SUMMARIES

- City of Bloomfield Hills
- City of Farmington
- City of Farmington Hills
- City of Keego Harbor
- City of Northville
- City of Novi
- City of Orchard Lake Village
- City of Pontiac
- City of Rochester
- City of Southfield
- City of South Lyon
- City of Sylvan Lake
- City of Troy
- City of Walled Lake
- City of Wixom

*Note: Cities substantially within the Twelve Towns Drainage District in southeast Oakland County were not included in the survey. These cities are substantially developed and do not have stormwater management programs.

The twelve incorporated villages of Oakland County have also not been included.

CITY OF BLOOMFIELD HILLS

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Bloomfield Hills has completed a study of the major branches of the Rouge River which pass through Bloomfield Hills. The City has also cooperated with Bloomfield Township and the City of Birmingham on storm drain system planning.

Regulatory Programs

Proposals for site plans are reviewed by the City and the consulting engineer. Due to flooding problems which have occurred in the past, the City Council is concerned that drainage be properly handled on the site and on-site retention of stormwater provided as needed. Stormwater retention on the site is required when receiving waters are not capable of adequately carrying stormwater runoff. The majority of recent developments, however, have provided retention basins or ponds. Retention/detention basins and storm sewers, when required, are normally designed for a 10-year storm frequency. Engineering design standards have not been adopted by Bloomfield Hills.

In the review of retention basins, facilities which are attractively landscaped are encouraged. Either dry detention facilities or wet facilities may be constructed. On small sites, parking lots are also used for stormwater retention purposes.

Natural infiltration through the use of depressions and swales on the property is not encouraged. Depending on the particular circumstances, depressions would normally be required to have some type of outlet to prevent flooding onto adjacent property. Some natural infiltration, however, is a by-product of the single-family home development on large lots (1-1/2 acres in size) as well as the landscaping requirements of the Zoning Ordinance. Cluster development and planned unit development options in the Zoning Ordinance also encourage preservation of open space which leads to some natural infiltration.

Grading plans are not required for site plan review purposes. Plot plans for single-family homes are not subject to drainage reviews. The Oakland County Drain Commissioner issues erosion and sedimentation control permits when required by state law.

Operation and Maintenance Programs

Enclosed storm drains and ditches have been approved and constructed by the City of Bloomfield Hills. In some instances, storm drains are maintained by the City. The City of Bloomfield Hills does not own or maintain stormwater retention facilities. Retention basin maintenance is the responsibility of the private owner. Maintenance agreements with developers of subdivisions are not required.

For Further Information:

Mr. Robert J. Stadler
City Manager
City of Bloomfield Hills
45 E. Long Lake Road
P.O. Box 288
Bloomfield Hills, MI 48013
(313) 644-1520

Mr. Thomas Ritchie
Consulting Engineer
Hubbell Roth & Clark, Incorporated
P.O. Box 824
Bloomfield, MI 48013
(313) 338-9241

CITY OF FARMINGTON

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Farmington does not have adopted plans related to drainage and stormwater management.

Regulatory Programs

When site plans are submitted to the City of Farmington for review, the plans are directed to the engineer. Aspects of site plans related to grading and drainage are reviewed. The City does not require on-site retention of stormwater.

The City is substantially developed. Most areas are served by existing storm drains or combined storm and sanitary sewers. As a general policy, all major site plans must provide storm sewer capacity for a 10-year frequency storm volume. Natural infiltration of stormwater is not encouraged due to clay soils. Rear yard drainage from individual lots is reviewed to insure that adverse impacts on adjacent properties are not created. Catch basins are sometimes required.

The Oakland County Drain Commissioner issues erosion and sedimentation control permits within the City of Farmington. The City's building inspector assists with inspection and monitoring of permitted sites.

Operation and Maintenance Programs

The City owns and maintains some storm drains within the City. Retention facilities are not owned or maintained. Any retention facilities constructed are the responsibility of property owners.

For Further Information:

Mr. Frank Papke, Consulting Engineer
Orchard, Papke, Hiltz, and McCliment
34935 Schoolcraft
Livonia, MI 48150
522-6711

CITY OF FARMINGTON HILLS

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Approximately 10 years ago, the City of Farmington Hills adopted a storm drain plan which showed the location of existing and proposed storm drains necessary to remove surface stormwater runoff.

A new master storm drainage plan based on a different philosophy of stormwater management is now being prepared. Rather than focusing on the removal of stormwater from the City, the plan will view stormwater as a resource, to be retained on-site with multiple benefits for City residents. Drainage flows from outside city limits as well as downstream flows to other communities will be identified, based upon the City's Master Land Use Plan. Lowlands which may serve as storage and retention areas will be identified. Methods for maintaining and financing proposed drainage improvements will be specified in order to insure implementation. The projected completion time for the study is Spring, 1981.

Regulatory Programs

The following regulatory programs of the City of Farmington Hills affect drainage and stormwater management:

- Site Plan Design Standards;
- Open Space Development Options; and
- Flood Damage Prevention Ordinance.

In addition, the City administers an erosion and sedimentation control program in conformance with requirements of the Michigan Soil Erosion and Sedimentation Act (Act 347, P.A. of 1972). The City encourages basic erosion and sedimentation control practices for site plans and single-family homes.

Major provisions and policies related to stormwater management are summarized here.

1. Site Plan Design for Retention

   Any site that utilizes an unimproved outlet for drainage must retain the increased runoff on-site. The actual effect of this requirement is the retention or detention of stormwater on small and large site plans and subdivision plats.

Retention must be provided for a stormwater volume equivalent to the following depth of water over the entire site:

single-family - 1.65 inches

multiple - 1.85 inches

commercial and industrial - 2.0 inches

Volume requirements are specified in inches rather than storm frequency in order to simplify storage calculations. Discharge from the site is limited to 0.2 cfs/acre. If the basin does not have an outlet, volume at least equivalent to storage for a 100-year frequency storm is required.

Retention and detention basins with side slopes exceeding one foot vertical to six feet horizontal must be fenced. The City encourages the design of basins with gradual side slopes and no fences, since such designs are more attractive and facilitate the use of basins for recreation. The basin must be constructed to drain entirely unless designed to retain a permanent water level which conforms to the aesthetics of a landscape plan.

Farmington Hills also has adopted specific engineering standards related to right-of-way drainage. Enclosures of drainage ditches are generally not permitted. Open ditches are preferred because they slow stormwater flows, allow some detention of stormwater, and reduce immediate flows of stormwater into receiving streams. Enclosed drain systems along roadways may be permitted in special cases.

Although natural infiltration of stormwater is considered desirable, it is not considered feasible as a stormwater management technique for meeting detention requirements because of the high cost of land.

2. Open Space Development Options

In 1969, Farmington Township adopted a "planned residential district" development option as part of the Zoning Ordinance (Farmington Township became the City of Farmington Hills in 1973). The planned residential district allows a mixture of types of dwelling units and preserves open spaces. At least one-third of the total bedrooms in residential units must be single-family homes, and at least 25% of the total gross land area within the project must be park or open spaces. A minimum of 50 detached single-family homes must be included within each planned residential district. A development plan for the site (including the proposed stormwater drainage system) must be submitted for review and approval.

A planned unit development option and a cluster option are also include in the present Zoning Ordinance. The purpose of a planned unit development is to preserve open space while allowing a reduction in lot sizes for residential units. The purpose of the cluster option is to provide, through design innovation, an alternative layout pattern which encourages open space protection.

Although the specific development and density requirements of the planned residential district and the planned unit development option are different, the intent and general effect is the same. Both options allow developers more flexibility in meeting housing market needs, while providing large areas of common open space. Although not directly intended for stormwater management purposes, the open spaces (which include rolling topography and wooded lots in many cases) hold stormwater temporarily during storms and allow more natural infiltration of stormwater than would otherwise occur.

The City of Farmington Hills encourages open space preservation for all development proposals, even if the open space development options are not used. To assist the City in completing development reviews, an environmental inventory which identifies wetlands, water bodies, and areas of steep slopes has been completed. The inventory allows the City to identify potential development problems or hazards which require examination in the site plan or subdivision plan review process.

3. Flood Damage Prevention Ordinance

The stated purpose of the Flood Damage Prevention Ordinance (Chapter 66 of the City Code) is to reduce flood hazards and damages. The effect of the ordinance, however, is to provide substantial protection to natural floodplains and wetlands within the floodplain. When left in their natural state, floodplains and wetlands have substantial absorption and detention value.

The ordinance requires approval by the city engineer of any new construction within special flood hazard areas (the 100-year floodplain, as defined by special studies completed by the U.S. Department of Housing and Urban Development). Within the floodway, encroachments and new construction are prohibited if any increase in flood levels would result. In the floodplain fringe, the city engineer reviews new construction proposals in accordance with principles of compensating excavation whereby the storage volume that exists within the floodplain is retained.

Operation and Maintenance Programs

The City of Farmington Hills owns and maintains many storm drain within highway rights-of-way. The City does not maintain any retention facilities.

In the future, it is possible that the City will become directly involved in the construction and maintenance of basins to serve several property owners.

When retention or detention basins are included in subdivision developments, a development agreement which provides for maintenance of stormwater facilities (as well as common open space areas) must be signed. Developers then include restrictive deed covenants in the property deeds which provide for the maintenance of facilities by homeowner associations. Development agreements provide the City with authority to carry out necessary maintenance and assess benefiting property owners if the homeowner association fails to carry out its assigned responsibilities.

For Further Information:

Mr. Thomas P. Biasell, City Engineer
City of Farmington Hills
31555 Eleven Mile Road
Farmington, MI 48018
(313) 474-6115

CITY OF KEEGO HARBOR

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Keego Harbor has a proposed stormwater drain program which would provide for the construction of local storm drains. The storm drains would discharge into nearby lakes, but proper steps would be taken to reduce adverse water quality impacts on the lakes. Federal funding is being sought to initiate the project.

Regulatory Programs

Apart from a small number of individual lots, the City of Keego Harbor is completely developed. Site plans and subdivision plats, therefore, are not received for review purposes.

When individual house plot plans are submitted for review, stormwater drainage from the site and flooding hazards are considered. Because the City has flat topography and is adjacent to several small lakes, flooding is the major concern.

Operation and Maintenance Programs

Although the City of Keego Harbor does not own storm drains, some maintenance has been done on county drains in the past. The city has contracted with private firms to perform necessary maintenance work in special cases.

Retention or detention basins for stormwater management purposes have not been constructed in the City for new developments. However, a retention basin owned and maintained by the City (located behind City Hall) receives stormwater from approximately one-third of the area of the City.

For Further Information:

Ms. Josephine Ward, City Clerk
City of Keego Harbor
2025 Beechmont
P.O. Box 595
Keego Harbor, MI 48033
(313) 682-1920

CITY OF NORTHVILLE

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Northville has not adopted plans related to stormwater management or drainage.

Regulatory Programs

The City of Northville reviews site plans and subdivision plats to assure protection of public health and safety. The grading plan is reviewed to insure adequate drainage of stormwater from the property and to insure that significant problems are not created by the development.

The City does not have an adopted policy related to on-site retention of stormwater, although retention facilities are sometimes required. The City's consulting engineer identifies development proposals which may create significant downstream flooding problems. If retention is required, basins must be designed to hold stormwater from a 10-year frequency storm. Natural infiltration of stormwater into the ground may be encouraged if soils are suitable.

Through cluster development options (such as planned unit development) the City encourages the preservation of open space in large developments. The city also encourages the preservation of a vegetative buffer between developments and water courses.

Plot plans for individual homes are reviewed to insure that new development does not create drainage problems for adjacent properties. Technical approaches used to control drainage vary among different projects. In some cases, back yard drainage swales have been required.

Operation and Maintenance Programs

Northville owns and maintains all storm drains in the City, except county drains and several small collection systems. Basic maintenance on City drains is provided.

If retention basins are constructed in new subdivisions, maintenance by the homeowner association would be required (none have been required to date). In other cases, retention basin maintenance is the responsibility of the individual owner.

For Further Information:

Mr. Harold W. Penn, Consulting Engineer
H.W. Penn Engineers
46150 W. Main
Northville, MI 48167
(313) 349-1766

CITY OF NOVI

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

Although the City of Novi does not presently have a stormwater management plan, the possibility of initiating a planning project has been discussed by the City. The intent of a plan would probably be to assign each area of the City a certain amount of allowable stormwater flow.

Regulatory Programs

The City of Novi has recently adopted "Policy and Design Standards for Storm Water Holding Facilities" as part of their stormwater management program. Other regulations related to stormwater management include the soil erosion ordinance (Ordinance No. 77-82) and the surface and ground drainage ordinance (Ordinance No. 72-53). The major provisions of these ordinances are summarized below:

Policy and Design Standards for Storm Water Holding Facilities:

All new developments are required to contain a stormwater holding facility, such as a detention or retention basin. The type, size, and location of the retention facility varies according to the individual site conditions. Design standards are applied by the city and consulting engineers when subdivision plats or site plans are proposed.

On-site detention facilities must reduce stormwater outflow from the site to an agricultural runoff level (.2 cfs/acre). Basins, parking lot detention, rooftop detention, and other methods which may be considered under special circumstances are permitted. (Natural infiltration is rarely used due to clay soils through the City.)

All detention ponds must be capable of complete dewatering by gravity. Pump discharge is allowed only under special conditions. A paved swale with a minimum grade of 1% must be provided from the inlet to the outlet of the basin. Side slopes must be no steeper than one foot vertical to five feet horizontal, unless it is determined that undue hardship on a proposed development will result. A spillway to provide for overflow at the high water level must be included in the design.

A 12-foot wide access easement and a 10-foot wide paved access road must be provided for all detention basins. A 10 foot wide maintenance strip around the perimeter of the basin must also be provided.

If at any time, the detention basin is to function as a sediment basin, an outlet filter must be provided. The use of a detention basin for sediment control purposes, however, may only be a temporary measure.

Stormwater volume equal to the runoff of a 10-year frequency storm must be retained, according to the ordinance. Volume requirements are calculated by using the formula recommended by the Oakland County Drain Commissioner. All sites must provide a six inch diameter outlet pipe (or equivalent) to the receiving drainage course.

Parking lot detention is permitted if it does not adversely affect the functioning of the business or create a public nuisance. The required storage volume is the same as for basin detention. Where applicable, up to 12 inches of stormwater storage will be permitted. Roof top detention is only permitted on new buildings with specially designed structures.

Retention ponds constructed solely for stormwater management purposes will be permitted only if no drains or natural drainage courses for discharging to a detention pond is reasonably available to the developer. Retention ponds are considered temporary measures, to be discontinued as soon as a drain becomes available to the development. Retention facilities must be designed to hold runoff from two consecutive 100-year frequency storms of infinite duration over the entire tributary area. A comprehensive soil investigation including a determination of groundwater levels is required. (Other requirements related to detention ponds also apply.)

Ground cover must be established immediately following the construction of a detention or retention basin. The ground cover must be established on basin bottoms, side slopes, a 10-foot wide maintenance strip, and an additional 10-foot width around the entire perimeter of the basin.

Soil Erosion and Sedimentation Control Ordinance:

The City of Novi administers and enforces requirements of the Michigan Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972). The City's ordinance describes sediment control plan requirements, reviews procedures, erosion control measures and design principles, and provisions for inspection and enforcement. Most land development plans must contain the following:

- Location Map
- Topographic Plan
- Site Development Plan
- Final Grading and Drainage Plan
- Erosion and Sediment Control Plan

Erosion control measures and design principles which are particularly relevant to stormwater management include the following:

- Sediment caused by accelerated soil erosion shall be removed from runoff water before it leaves the site of the earth change activity;
- All temporary and permanent facilities constructed for the conveyance of storm runoff around, through or from the earth change area shall be designed to limit the flow to a nonerosive velocity;
- Permanent soil erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed within 15 calendar days after final grading or the final earth change has been completed;
- The development should be planned and designed to fit the topography of the site.

A number of other specific measures are noted in the ordinance.

Depending on the erosion potential of an activity, on-site inspections before, during, and after any earth change activity will be performed. The Novi Department of Building and Safety administers the ordinance.

Surface and Ground Drainage Regulations:

The City of Novi has adopted a special ordinance regulating surface and ground drainage, sump pump discharge, and building or house downspouts. The provisions of the ordinance apply to plot plans for individual homes which would typically not be reviewed by the Planning Commission or the city engineer.

As stated in the ordinance, it is unlawful for any person to interfere with or obstruct the flow of surface water over easements for public utilities or to impede the flow of surface water in a manner different from the approved grading plan and drainage pattern.

> Footing drain discharge must flow into storm drain facilities or upon the surface of the ground in cases where no storm drainage facilities are available. When footing drain discharge is deposited upon the ground surface, the area must drain directly to a street or to the yard which contains a drainage easement, without crossing another parcel of land.
>
> Building of house downspouts are to be directed to a front or rear yard where adequate runoff is provided.

The above regulations reflect the policy and philosophy of the City of Novi to manage stormwater in a comprehensive manner. In addition to reducing flooding and runoff problems, the City is concerned about the attractiveness of the facilities.

Operation and Maintenance Programs

The City of Novi does not own or maintain storm drains.

Adopted ordinances specify maintenance requirements for erosion and stormwater management facilities. Developers are responsible for the maintenance of sediment basins during construction (including maintaining filters, removing filters when vegetative cover is established, and removing sediment deposits during construction).

An agreement for operation and/or maintenance of a subdivision detention basin system must be executed by a developer prior to the issuance of a building permit or final approval of a subdivision plat. Typically, homeowner associations are responsible for basin maintenance. If homeowner associations fail to adequately maintain facilities, the City of Novi has the legal right to perform such maintenance and assess the residents.

For Further Information:

Mr. Patrick G. Keast
Consulting Engineer
Mosher-Kapelczak, Incorporated
9215 Dixie Highway
P.O. Box 329
Clarkston, MI 48016
(313) 625-5450

CITY OF ORCHARD LAKE VILLAGE

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Orchard Lake Village does not have adopted plans related to drainage and stormwater management.

Regulatory Programs

The City of Orchard Lake Village has engineering design standards for storm sewer construction. As referenced in the storm sewer standards, "where retention ponds are required they shall be designed in accordance with Oakland County Drain Commissioner's standards." Specific design requirements which extend beyond the Drain Commissioner's standards have not been adopted.

It is the general recommendation of the consulting engineer that retention basins be required by the City when the receiving water body does not have capacity to handle additional stormwater. A major portion of the City abuts Orchard, Cass or Upper Straits Lakes. Since these lakes have significant stormwater retention capability, retention basins for new developments have not been frequently required.

In most cases, the consulting engineer would not recommend approval of stormwater discharge to low lying areas unless some type of outlet for the stormwater is provided. Without an outlet, flooding onto adjacent property could be a problem. Some natural infiltration of stormwater occurs, however, as a result of available open space. Large lot development in the City has helped protect grassed areas and open space. Development setback requirements for Orchard Lake are included in the Zoning Ordinance. A Planned Residential Development provision for the Zoning Ordinance was proposed several years ago but met with severe criticism from citizens and has not been adopted.

Erosion and sedimentation control permits are issued by the Oakland County Drain Commissioner for development proposals within the City of Orchard Lake which disturb one or more acres of land within 500 feet of a lake or stream. In addition, the City requires the submittal of grading plans for erosion and sediment control.

Design principles which are used in the review process include the following:

- The smallest practical area of land should be exposed at any one time during development.
- When land is exposed during development, the exposure should be kept to the shortest practical period of time.

- Temporary vegetation and/or mulching should be used to protect critical areas exposed during development.
- Sediment basins should be installed and maintained to remove sediment from runoff waters from land undergoing development.
- Provisions should be made to effectively accommodate the increased runoff caused by changed soil and surface conditions during and after development.
- The permanent final vegetation and structures should be installed as soon as practical in the development.
- The development plan should be fitted to the topography and soil so as to create the least erosion potential.
- Wherever feasible, natural vegetation should be retained and protected.

These design principles are applied to both site plan and subdivision plat reviews, even in cases where a soil erosion and sedimentation control permit from the Oakland County Drain Commissioner is not required.

In the past, flooding problems resulting from single-family residential development have occurred. To avoid problems, plot plans are reviewed to determine initial and final grade elevations. Discharge of stormwater onto adjoining properties (exceeding the pre-development discharge rate) is generally not permitted.

The City's Wetland and Watercourse Protection Ordinance regulates alterations of wetlands in the City. The purposes of the Ordinance include the following:

- To provide for the protection, preservation, proper maintenance and use of City watercourses and wetlands in order to minimize disturbance to them and to prevent: damage from erosion, turbidity or siltation; a loss of fish or other beneficial aquatic organisms; a loss of wildlife and vegetation; and/or the destruction of the natural habitat thereof;
- To provide for the protection of the City's potable fresh water supplies from the dangers of drought, overdraft, pollution or mismanagement; and
- To secure safety from floods; to prevent loss of life, property damage, and other losses and risks associated with flood conditions; to reduce the financial burdens imposed upon the community through rescue and relief efforts occasioned by the occupancy or use of areas subject to periodic flooding; to protect individual and community riparian rights; to preserve the location, character and extent of natural drainage courses.

As stated in the ordinance, proposals to dredge and fill wetlands or place structures in wetland aras are prohibited without obtaining a permit. The construction of pipes carrying stormwater runoff from any residential site of two or more single-family residences, commercial sites, parking areas, roads, or other areas with pollutants is also prohibited.

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When permit applications are reviewed, the City considers the possible effects of the proposed operation on water quality (including filtering action), and the effect upon adjoining wetland or drainage areas and water tables. Other considerations relate to fish and wildlife habitat, economic impact, zoning and land use plans, and recreational impact.

Operation and Maintenance Programs

The City of Orchard Lake Village presently maintains two existing retention basins plus some existing storm drains. In most cases, if retention basins are required, maintenance will be the responsibility of private landowners. Some assurance of effective maintenance must be provided to the City prior to project approval.

For Further Information:

Ms. Janet Overhold, Clerk
City of Orchard Lake Village
3951 Orchard Lake Road
Orchard Lake, MI 48033
(313) 682-2400

Mr. Thomas Ritchie
Consulting Engineer
Hubbell, Roth, & Clark, Inc.
P.O. Box 824
Bloomfield, MI 48013
(313) 338-9241

CITY OF PONTIAC

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Pontiac has not adopted plans related to drainage or stormwater management.

Regulatory Programs

Although engineering design standards related to stormwater and on-site retention have not been adopted by the City, the city engineer reviews all site plans and subdivision plats to assure proper drainage.

On-site retention of stormwater is required when new development is proposed in the northern section of Pontiac where flooding problems have been experienced. The stream channels in this area do not have the capacity to carry additional runoff. In other areas of the City, discharge of stormwater into adjacent rivers and streams (without on-site retention) is permitted.

The design of the basin is the responsibility of the developer's engineer. Several dry detention basins have been constructed to date. Basins must be able to retain a volume of stormwater equivalent to runoff from a year frequency storm and discharge to the receiving stream at the agricultural rate.

In the review of site plans and subdivision plats, open space preservation is encouraged. In some cases, open spaces have been planned in order to protect the floodplain (reducing downstream flooding problems) and to allow for natural infiltration of runoff. Vegetated buffer strips between the development and the watercourse are definitely encouraged.

The City of Pontiac is designated by the State to administer the Michigan Soil Erosion and Sedimentation Control Act (Act 342, P.A. of 1972). The City's Soil Erosion and Sedimentation Control Ordinance No. 1711 sets forth permit conditions and procedures. Permits will not be issued where, in the opinion of the soil engineer:

1. The proposed grading would cause hazards to the public safety welfare;

2. The work as proposed by the applicant will damage any public or private property or interfere with any existing drainage course in such a manner as to cause damage to any adjacent property or result in the depositing of debris or sediment on any public way or into any waterway or create an unreasonable hazard to persons or property;

3. The land area for which grading is proposed is subject to geological hazard to the extent that no reasonable amount of corrective work can eliminate or sufficiently reduce settlement, slope instability or any other such hazard to persons or property;

4. The land area for which the grading is proposed may lie within the flood plain of any stream of water-course, unless a hydrologic report, prepared by a professional engineer, is submitted to certify that the proposed grading will have, in his opinion, no detrimental effect on the public welfare or upon the total development or the watershed; and

5. The land area in which grading is proposed lies within the flood plain of any stream or water-course specifically designated and delineated by the City of Pontiac as an area subject to flood hazard.

When development is permitted, specific soil erosion control measures are required by the engineering department. The county's technical assistance manual, "Erosion and Sediment Control Design Criteria", is used by the City of Pontiac. Straw bale berms are the primary type of control measure required during construction.

Grading plans for site plans and subdivision plats are also reviewed by the city engineer. The primary purpose of the grading plan review is drainage control -- not erosion control.

Operation and Maintenance Programs

The City of Pontiac owns and maintains a system of storm drains in the city. In addition, the City owns and maintains retention basins which provide drainage for public streets. The City presently owns two retention basins of this type. To date, very little maintenance on the basins has been required.

For Further Information:

Mr. Clyde Christian, Engineer
City of Pontiac
Department of Public Works
55 Wessen
Pontiac, MI 48053
(313) 857-7730

CITY OF ROCHESTER

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Rochester does not have adopted plans related to stormwater management.

Regulatory Programs

Specific regulations related to stormwater management have not been adopted in the City of Rochester. Nevertheless, all major subdivision plats or site plans are reviewed to insure that stormwater problems do not result. The City enforces the provision that stormwater from one site not be permitted to drain onto an adjacent property and cause damage.

Grading plans related to subdivision plats and site plans are carefully reviewed by the township and consulting engineers to insure that erosion will not result. Although erosion and sedimentation control permits are issued by the Oakland County Drain Commissioner, the City of Rochester assists with monitoring and enforcement.

Operation and Maintenance Programs

The City owns and maintains some storm drains within the City of Rochester. Maintenance activities primarily involve removal of brush and debris.

For Further Information:

Mr. Arthur Brennan, Building Inspector
City of Rochester
400 Sixth Street
Rochester, MI 48063
(313) 651-9061

CITY OF SOUTHFIELD

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Southfield has not developed or adopted stormwater management plans.

Regulatory Programs

All site plans and subdivision plats are reviewed by the Engineering Department to insure that adequate drainage facilities are provided. Although engineering design standards related to retention/detention facilities have not been adopted, the engineering department has developed a consistent approach and method for completing stormwater reviews. City ordinances which relate to stormwater management or erosion control include the following:

- Soil Erosioin and Sediment Control Ordinance;
- Floodplain Controls (Section 5.49 of the Zoning Ordinance); and
- Community Impact Statement Requirements (Section 5.51 of the Zoning Ordinance).

Each of these elements is highlighted below:

Stormwater Facility Requirements:

Although stormwater facility or on-site retention standards have not been officially adopted, the City Council has clearly stated the policy that all developments must make provisions for on-site retention. In previous years, the policy that landowners must connect to storm sewers and abandon retention facilities has existed. Overall benefits from stormwater retention/detention and the permanent nature of basins are now being appreciated.

Stormwater equivalent to a 10-year frequency storm must be trapped on the site. The Southfield City Engineer has developed a simple formula for calculating the minimum storage volume required (slightly different from the formula used by the Oakland County Drain Commissioner). Discharge of stormwater from the site is restricted to the agricultural runoff level (0.2 cfs/acre). A greater stormwater volume is not required because most developments are small with limited space on-site for retention or detention facilities.

Both retention and detention basins have been constructed in Southfield -- there is no preference for a certain type of basin. Whereas fenced retention basins have been constructed in the past, efforts are now made to insure that the basins are attractive assests to the development. Slopes which are 6:1 feet or more shallow are encouraged. Several recent developments have successfully integrated retention/detention facilities with recreational uses.

Parking lots are sometimes used to meet detention/retention requirements, especially for small commercial parcels. Infiltration of stormwater into the ground is recognized as the best solution to stormwater control; unfortunately, the smaller parcels of land (generally no more than 20 acres) prohibit extensive use of infiltration techniques.

Enclosed drains (storm sewers) leading to retention facilities are required by the City. In low density residential areas (west of Telegraph Road), however, open ditches are preferred. Although maintenance of open ditches may be more expensive than enclosed drains, open ditches offer advantages such as added capacity, lower velocity (less erosion), and periodic restrictions of flow (at culvert locations). The potential for seepage into the soil is also enhanced.

Individual plot plans (such as for a single-family home) are reviewed to insure that the sites do not drain onto adjacent property (as specified in the building code).

Catch basins with cast iron elbows to catch sediment and prevent the sediment from entering the storm drains are required. The special feature was initially required for combined sanitary/storm sewers, but is now required for all situations.

Soil Erosion and Sediment Control Ordinance:

The City of Southfield has been designated by the State of Michigan as an authorized agency for administering the Michigan Soil Erosion and Sedimentation Control Act (Act 347, P.A. of 1972) within the City. The City's ordinance is based upon the requirements of the state law and regulations.

As stated in the ordinance, it is unlawful for any person to engage in an earth change activity in such a manner as to allow uncontrolled accelerated soil erosion on the site of the work or to allow sedimentation of the eroded soil off of or away from the site of his work. Plans for soil erosion and sedimentation control must be included with site and project plans proposed for construction. Plan review for soil erosion requirements must be carried out concurrently with other technical reviews. General design principles are specified in the ordinance.

Floodplain Controls (Section 5.49 of the Zoning Ordinance):

As stated in Southfield's Zoning Ordinance, "It is the purpose of the floodplain controls to apply special regulations to the use of land in these areas of the city which are subject to predictable flooding at frequent intervals and to protect the storage capacity, ground water recharge, and water purification of floodplains and to assure retention of sufficient floodplain area to convey flood flows which can reasonably be expected to occur and to better maintain environmental factors and the proper ecological balance through prohibiting unnecessary encroachments."

Uses are severely restricted in the regulatory floodplain district. Development in the floodplain fringe district must meet certain requirements related to flood damage prevention and erosion control. Tax reductions in floodplains have been made to provide an incentive for landowners to retain floodplain lands in a natural state.

Community Impact Statement Requirements (Section 5.51 of the Zoning Ordinance):

The intent of the community impact statement requirements is to assure that relevant information concerning the environmental, economic, social, and cultural effects on the community (related to rezoning and/or site plan review procedures) is available for decision-makers. As stated in the zoning ordinance, "It is necessary to minimize pollution, protect wildlife and ecologically important features, retain environmental resources, and to investigate the adequacy of public utilities and facilities such as sewer, water, and transportation system." Rezoning or site plan approval requests for parcels 10 acres in size or larger, developments of 150,000 square feet or greater, or developments of 200 or more dwelling units are subject to the community impact statement requirements. A point system has been developed to identify smaller developments which require impact statements.

A description of the project and an analysis of the impact on the community are required for a community impact statement. A public hearing is held to allow for public review and comment.

The landscaping requirements of the Zoning Ordinance are also relevant to stormwater management. Whenever land use requires more than 20 parking spaces and landscaping is required, a landscaping plan must be submitted to the planning department. The arrangement of the landscaping is to be done so as to contribute significantly to safe circulation, visual orientation, and other positive environmental values. The City encourages the integration of detention/retention facilities with the landscaping plan. A minimum amount of paved surfaces and the retention of a vegetated buffer strip between the development and a water course are encouraged.

Operations and Maintenance Programs

Southfield owns and maintains a system of enclosed storm drains. Catch basins which retain sediment are subject to regular maintenance. The City does not own or maintain retention/detention facilities. Special maintenance requirements (either for property owners or homeowner associations) have not been adopted.

For Further Information:

Mr. Wesley Peterson, City Engineer
City of Southfield
26000 Evergreen Road
Southfield, MI 48076
(313) 354-1000

CITY OF SOUTH LYON

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of South Lyon has not adopted plans related to drainage or stormwater management.

Regulatory Programs

Site plans and subdivision plats are reviewed by the city and consultants to identify potential problems to the community. Although engineering design standards related to site drainage and on-site retention of stormwater have not been adopted, a complete review is performed.

On-site retention of stormwater is required in some cases. The nature of the receiving stream and the potential for downstream flooding are considered in the review process. Stormwater volume storage requirements vary for individual sites. If a detention facility is required, discharge from the facility at a predevelopment rate is included in the design. The use of swales and depressions for stormwater detention is not encouraged through the stormwater review process. The City of South Lyon has adopted specific provisions in its Zoning Ordinance related to erosion and sedimentation control.

The South Lyon Zoning Ordinance allows for planned unit development proposals which increase density on one portion of the site and provide for open space preservation on other portions of the site. Most large sites within the city are now developed however, and future use of this development option is not anticipated.

Through the review of individual plot plans, the City prohibits additional drainage from new construction areas onto adjoining properties. Site drainage is controlled through rear yard or front yard drainage requirements.

Operation and Maintenance Programs

The City maintains some storm drains, but does not maintain retention facilities. Retention basin maintenance is the responsibility of the individual property owner.

For Further Information:

Mr. Bruce Jerome
Public Works Director
City of South Lyon
214 W. Lake Street
South Lyon, MI 48178
(313) 437-1735

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CITY OF SYLVAN LAKE

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Sylvan Lake does not have plans related to drainage or stormwater management.

Regulatory Programs

In order to save costs and take advantage of existing county services, the City of Sylvan Lake forwards development proposals to the Oakland County Drain Commissioner's office for review purposes. Advisory comments received from the drain commissioner are considered by the City in the review of site plans and subdivision plats. The City of Sylvan Lake is nearly completely developed.

When the City reviews plot plans for individual residential lots, drainage aspects of the site are reviewed. Drainage onto adjoining properties is prohibited (as required by the plumbing code). Special provisions (such as straw bales and stone filters) are sometimes required to reduce erosion on individual lots. Large development propsals require erosion and sedimentation control permits issued by the Oakland County Drain Commissioner.

A wetlands protection ordinance is being prepared by the City's consulting engineers.

Operation and Maintenance Programs

The City owns and maintains a system of storm drains in the City. Retention or detention basins have not been constructed, and are being avoided due to safety and maintenance problems.

For Further Information:

Mr. Horace M. Engler, Manager
City of Sylvan Lake
1820 Inverness
City of Sylvan Lake, MI 48053
(313) 682-1440

CITY OF TROY

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

In the late 1960's, the City of Troy adopted a drainage plan which delineated the locations of existing and proposed stormwater drains. Enclosed storm sewers as well as permanent open watercourses were shown. The study was updated in 1975.

Regulatory Programs

The City of Troy reviews all site plans and subdivision plats to assure that adequate on-site detention of stormwater as well as drainage from the site is provided. Troy initiated detention requirements in the mid-1960's in order to prevent flooding until such time as the enclosed storm drain system could be constructed. In 1970-1972, detention regulations were made more stringent to meet requirements of the U.S. Army Corps of Engineers related to the Henry Graham storm drain. The Henry Graham drain is a major drain connecting to the Red Run branch of the Clinton River. The City of Troy and the U.S. Army Corps of Engineers, through negotiations, agreed that the stormwater discharge from the Henry Graham drain would not exceed 800 cfs in order to avoid additional downstream flooding.

Since the adoption of engineering design standards, particular requirements have been modified a number of times in order to provide appropriate guidance to development. In addition to proper engineering design for stormwater control, the City of Troy is concerned about the appearance of basins and possible safety hazards.

Detention standards are applied to all site plans and subdivision plats. Basins must be designed to store three and one half inches of rain over the developed area of the site in commercial, industrial, office and high-rise residential areas. This standard is greater than volume from two consecutive 100-year frequency storms. For single-family residential development, detention basins must be designed to store all runoff in excess of agricultural runoff (0.1 - 0.2 cfs/acre).

All open detention basins with side slopes steeper than one foot vertical and six feet horizontal must be fenced, except where their design is an integral part of the landscape and where basins do not pose safety hazards. Detention basins designed architecturally and aesthetically for a location within the development must be approved on a concept basis by the Planning Department before engineering review.

Earthern detention basins, except when designed to hold water permanently, must have a six inch perforated underdrain to insure dewatering of the low area. Underdrains must not discharge directly into the basin outlet. Where a permanent body of water is incorporated in the retention system design, a constant course of fresh water must be provided.

The entire detention basin must be seeded or sodded. The City will not accept the basin until turf is established. Concrete rip-rap is required at all pipe entrances to the basin. An overflow system must be provided with an outlet into an adequately sized storm sewer, when possible. In cases where the drain outlet for the detention basin is not deep enough to completely dewater the basin, pumps must be installed. Two sets of pumps are required, with each set of pumps capable of handling the flow. Other detailed specifications pertain to fencing, the overflow system, and other features of basin design.

Grading plans are required for all developments and are reviewed for drainage control purposes. Rear yard drainage is required in all residential subdivisions. The City has adopted specific standards for rear yard catch basins and swales. Where topography prevents rear yard drainage from being practical, front yard drainage may be approved. Underdrains must be located in a drainage easement provided along the rear or side lot lines, as necessary. When the storm sewer is in the rear yard, the trench must be backfilled with pea gravel to the surface to act as a French drain. When the storm sewer is not in the rear yard, a perforated plastic underdrain pipe connecting to a storm sewer is required. These construction specifications provide for some infiltration of stormwater while also conveying stormwater to detention facilities or storm drains.

The City of Troy has adopted an erosion and sedimentation control ordinance in accordance with the Michigan Erosion and Sedimentation Control Act (Act 347, P.A. of 1972). Typical erosion control measures required during construction include silt traps, straw bales, stone filters, and dikes. Some silt traps and vegetation may be required for permanent erosion control as well.

Because of the predominance of clay soils, the City of Troy does not encourage the use of natural infiltration as a method for stormwater control. However, the City definitely encourages the preservation of open space areas which provide some absorption of stormwater. Typically, 10 percent of the site must be kept in open space and a greenbelt between the development and the watercourse maintained. Residential development options allow for higher density on part of the site if open space is maintained in other areas.

An environmental impact statement is required in conjunction with large developments, including:

1. When a project is proposed using public funds which significantly affects the quality of the human environment;
2. When a project is proposed which, in the opinion of the City Manager, significantly affects the municipal service systems (including storm drains);
3. When a development proposal constitutes a substantial departure from the intent of the Master Land Use Plan; and

4. When required by the City Code or required by the City Plan Commission in order to assist in their consideration of a particular development proposal.

An impact analysis on systems (including storm drains and retention facilities), services, economics, and the natural and social environment are required.

Operation and Maintenance Programs

The City of Troy has a system of improved county drains which covers approximately half of the total area of the City. The intent of the City is to serve the entire City with improved closed or open drains. Due to financing problems, however, it is possible that improved drains will not be constructed in the western areas of the City.

The City of Troy has a public works maintenance program which provides maintenance for certain detention facilities and storm drains. If a retention or detention basin is part of a residential or industrial subdivision, it may be deeded to the City of Troy. The City requires a permanent maintenance deposit which is then invested. The interest on the fund pays for the cost of maintenance. Approximately 100 basins are presently maintained by the City at an average cost of $600/basin/year. Maintenance includes cutting grass, removal of trash, and small repairs to insure functioning of the basin. Sediment removal has not been necessary, although it is expected to be needed in the future.

In order to remedy backyard flooding problems in older neighborhoods, a self-help technical assistance program is conducted. The City provides equipment and technical assistance to homeowners who participate in projects to construct backyard underdrains. The program has resulted in the construction of an extensive backyard drainage system.

For Further Information:

Mr. Robert Quigley, City Engineer
Mr. Laurence Keisling, Planning Director
City of Troy
500 W. Big Beaver Road
Troy, MI 48084
(313) 524-3300

CITY OF WALLED LAKE

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Walled Lake is nearly ninety percent developed, and does not have plans related to drainage or stormwater management.

Regulatory Programs

Drainage and grading plans for site plans and subdivision plats are reviewed by city officials and consulting engineers. Although engineering design standards for retention/detention basins have not been adopted, the City does follow the standards of the Oakland County Drain Commissioner.

On-site retention of stormwater is required with discharge restricted to the agricultural rate. Due to limited land area, natural infiltration is not encouraged. Retention and detention basins are typical methods used for on-site stormwater control. Storage volume equivalent to a 30-year storm frequency is required. Most basins constructed to date have been fenced, with standing water.

Individual plot plans for homes are reviewed to insure that stormwater is not discharged to adjoining property.

The City administers the state Erosion and Sedimentation Control Act within the City's boundaries. Both permanent and temporary measures to control erosion and stormwater flows are required.

Operation and Maintenance Programs

The City of Walled Lake does not own or maintain storm drains or retention/detention facilities.

For Further Information:

Mr. Earl P. Glaspie, Building Inspector
City of Walled Lake
1499 W. Maple
Walled Lake, MI 48088
(313) 624-4847

CITY OF WIXOM

STORMWATER MANAGEMENT PROGRAM SUMMARY

Planning Programs

The City of Wixom does not have adopted plans related to stormwater management or drainage.

Regulatory Programs

Although the City of Wixom does not have adopted engineering standards related to drainage and stormwater management, consistent policies are followed when plats and site plans are reviewed by the City and consulting engineers. It is the general policy of the City to require on-site retention of stormwater equivalent to a two inch rainfall over the entire site. The City also enforces the state Erosion and Sedimentation Control Act (Act 347, P.A. of 1972) in conformance with state regulations.

On-site retention or detention of stormwater is required for all site plans or subdivision plats. The volume of storage required (two inches of rainfall) is approximately the volume for a 10-year storm frequency. Discharge of stormwater from the site is limited to the agricultural rate of discharge, provided that the holding capacity of the basin is not exceeded.

The type of retention or detention facility recommended varies with the site in question. Natural infiltration of stormwater (through the use of natural depressions and swales) is encouraged. When space in the development is limited, the use of parking lots for temporary storage of stormwater is allowed. Grassed detention basins which are dry most of the time are preferred by the City, although retention basins with standing water may be permitted in some cases.

When plot plans for individual lots (included in a subdivision plat) are reviewed, a rear yard drainage is considered. Site grading is reviewed to insure that stormwater is collected and that adjacent properties are not affected. Sump pump discharge points are also reviewed.

The City of Wixom has adopted an erosion and sedimentation control ordinance to enforce state requirements. Typically, straw bales and sediment basins are required during construction. Sediment basins used during construction often are made into permanent retention/detention basins for stormwater. The City is concerned about erosion from the site during and after construction. A wetlands protection ordinance has also been adopted.

Operation and Maintenance Programs

In order to reduce the cost of development and city facilities, the City of Wixom encourages on-site retention of stormwater rather than the construction of closed storm drains. If individual developments have storm drains leading to retention/detention basins they are usually sized for a 10-year storm frequency volume.

The City owns and maintains certain enclosed storm drains which are part of subdivision developments.

When retention basins are constructed which require regular maintenance agreements with developers are required. In such cases, maintenance is the responsibility of the homeowner association. For small developments, maintenance is the responsibility of individual property owners.

For Further Information on Stormwater Policies:

Mr. Larry Pate, Consulting Engineer
Pate, Hirn, & Bogue, Incorporated
17000 12 Mile Road
Southfield, MI 48076
(313) 557-5760

For Further Information About Erosion Control Policies:

Mr. William Tyler, Building Inspector
City of Wixom
49045 W. Pontiac Trail
Wixom, MI 48096
(313) 624-4557

APPENDIX C: BIBLIOGRAPHY

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